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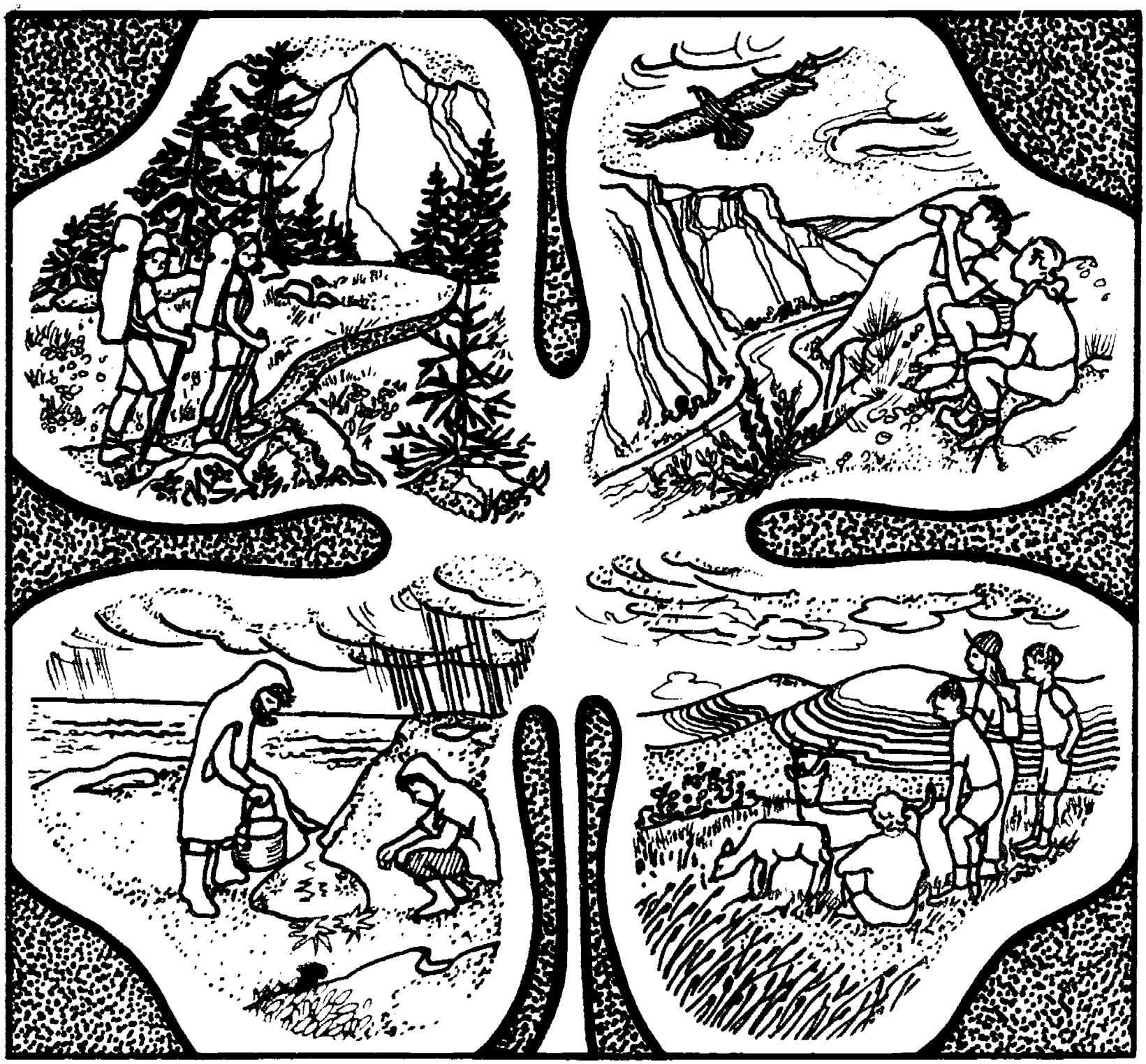
ABSTRACT

The United States has a rich natural resource heritage. It is important to educate students in the principles of conservation so that these natural resources may endure for generations. This guide is designed to help leaders to learn to organize groups of children and conduct successful meetings; provide fun, safe, outdoor learning experiences for children; use basic outdoor leadership skills; and get ideas for meetings, field trips, day and overnight hikes, tours, and additional resources. The 24 activities in this guide are grouped into eight groups: (1) "Air"; (2) "Marine"; (3) "Energy"; (4) "Forestry"; (5) "Range"; (6) "Soil"; (7) "Water"; and (8) "Wildlife". Each activity lists sites, objectives, materials, background, and procedures. A brief discussion of safety is included. Twenty-one references are listed. (CW)

4-H DISCOVERY



LEARNING OUTDOORS

LEADER GUIDE

GRADE 3

Cooperative Extension College of Agriculture & Home Economics Washington State University Pullman

EM 4798

About the Authors

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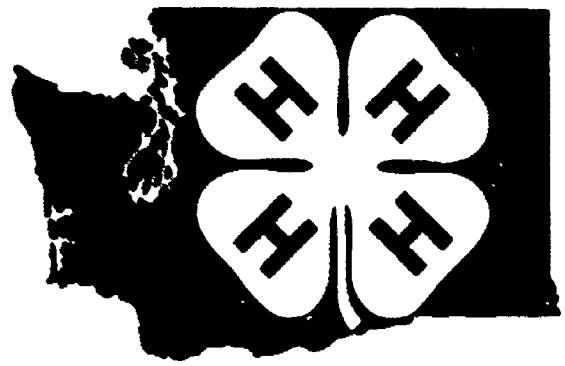

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INTRODUCTION

Reading and using this guide will help you:

- Organize a Discovery group and conduct successful meetings.
- Provide fun, safe, outdoor learning experiences for children.
- Learn basic outdoor leadership skills.
- Get ideas for meetings, field trips, day and overnight hikes, tours, and additional resources.

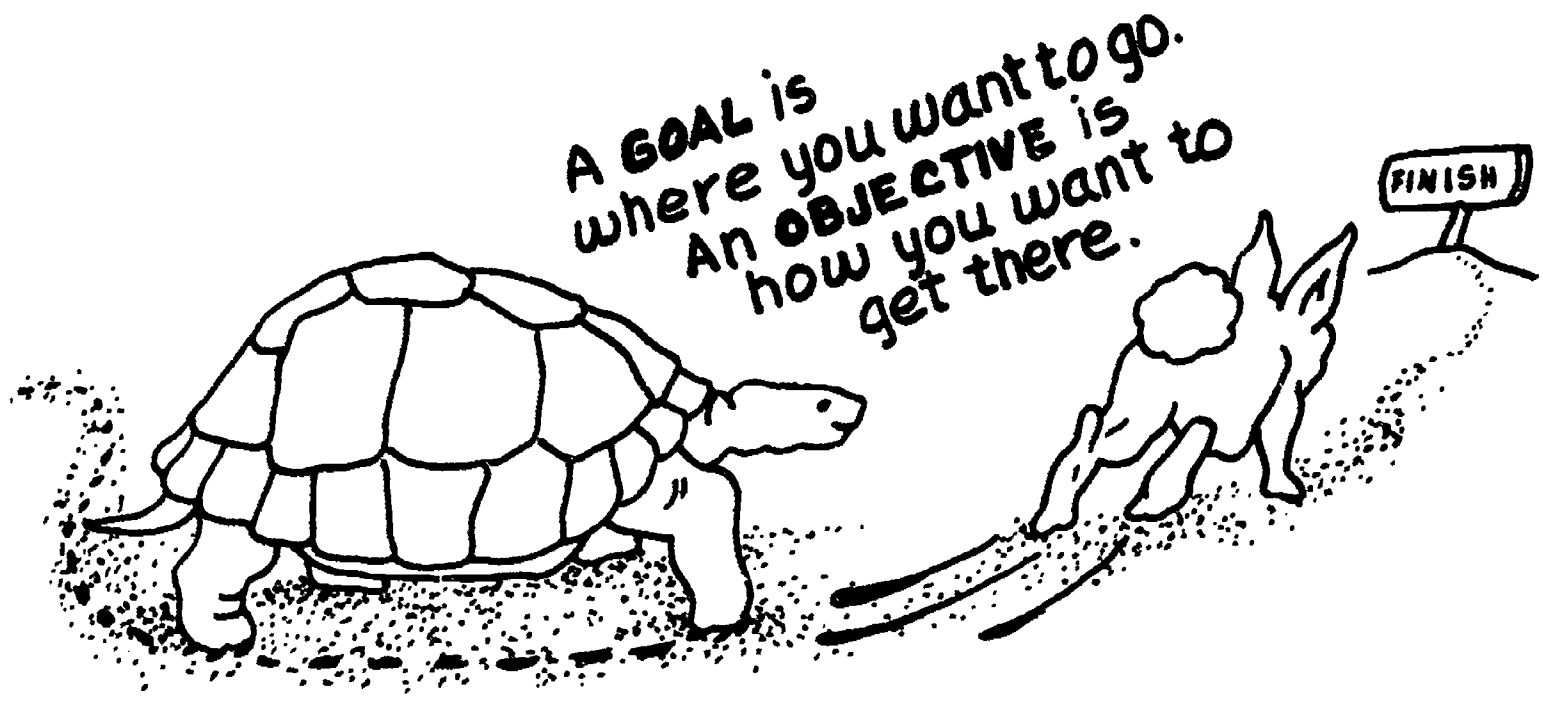
This guide will *not* give you an absolute blueprint for the project or an exclusive source for ideas. One of your challenges is to find the tools that work best for you and your group.

A Discovery Leader is a "people grower." Learning the children's interests, needs, and desires and helping them meet those in a positive, informal, learning environment is what the Discovery project is all about. You can help young people learn four important skills:

- How to learn
- How to get along with others
- How to use new knowledge
- How to feel good about themselves

What Makes the Discovery Experience Successful?

- Have the children establish goals for themselves and the group.
- Involve them in planning activities and sharing accomplishments.
- Plan activities that allow young people to talk with each other and with you.
- Keep indoor planning short. Field trips, day hikes and camping will hold their interest longer.
- Be flexible. Allow plans to be changed and modified in case of bad weather.
- Encourage family members to work with their children on the project and join you in conducting field trips, hikes, etc.
- Help young people apply what they learn and do to everyday living.



LEARNING OUTDOORS

The United States is a beautiful country and its people are aware and proud of their natural resource heritage. We wish to pass these natural resources and our desire to conserve them on to our children. Your role as a Discovery Leader will help ensure these goals.

Most activities in this guide may be done in your local community. It is not necessary to travel. You are encouraged to use your home, backyard, city parks, school yard, and local ponds or small lakes.

Characteristics of Third-Graders

Children at this age are improving their large motor skills. They like organized games and activities, as well as swimming, bicycling, and hiking. Physically, the girls are growing faster than the boys.

Third-graders enjoy problem solving, love trivia, are able to judge their own behavior, and have longer attention spans. They are more comfortable in an organized world.

At this stage, children have a well-developed sense of humor, and become frustrated when they do not like an assignment. They like to show their independence, but also want to know the rules. Peers are very important. These children need praise, can work through difficulties, like and accept themselves, and may withdraw rather than rebelling outwardly.

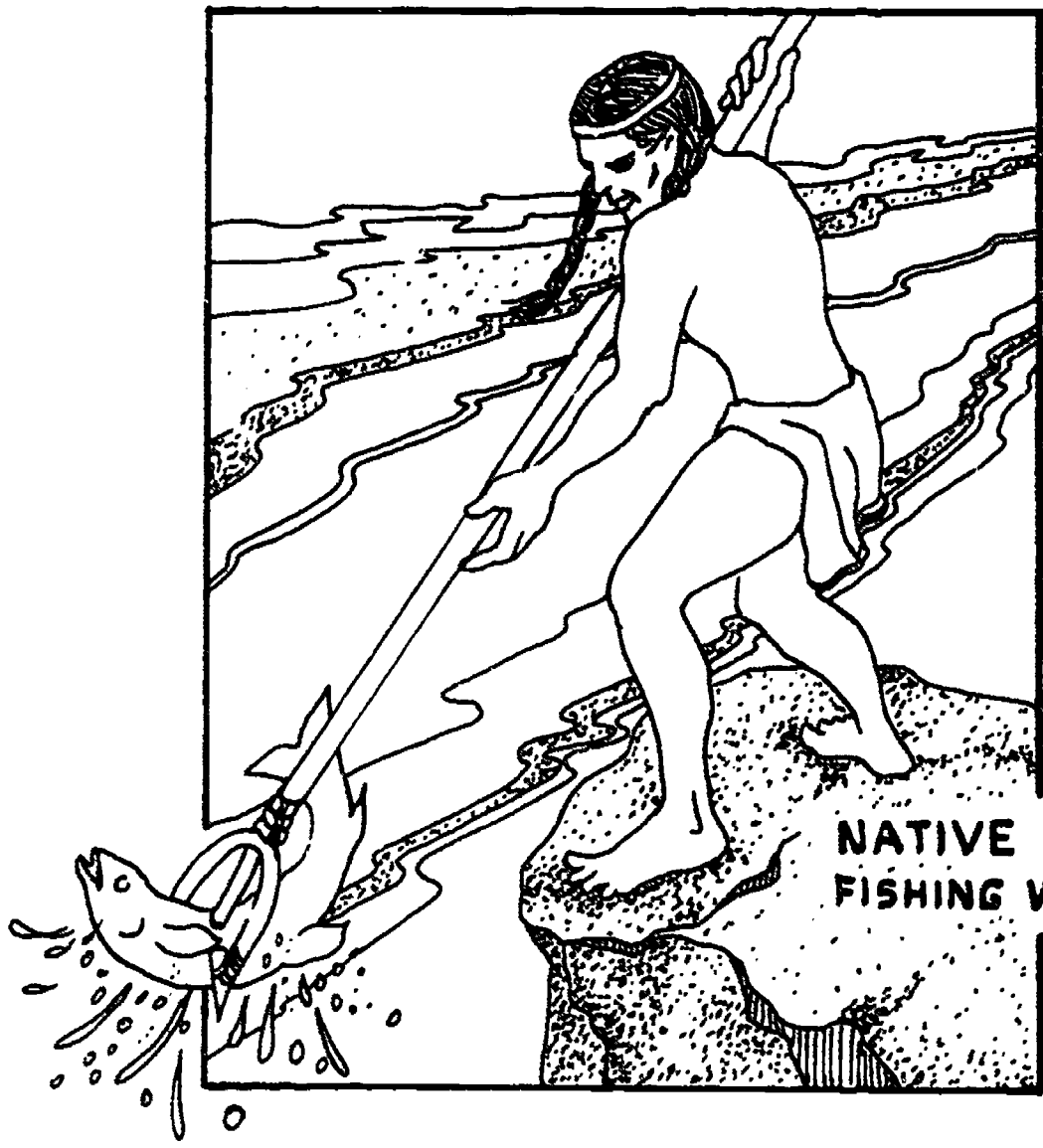
In relating to their peers, these children play in small groups, love to be chosen, like to plan and take trips, are great joiners, and are most cooperative when adults are fair. Boys express friendships by pushing, punching, or wrestling, while girls tend to have one best friend at a time.

Therefore, when planning learning activities, include things children enjoy doing. They like to:

- Collect objects from nature
- Hike and backpack
- Wade in streams and ponds
- Fish and hunt
- Observe wildlife
- Camp out
- Cook their own meals outside
- Figure out weights, measurements, and distances
- Sing songs

- Make crafts from nature
- Dig in the soil and sand
- Watch the stars
- Learn about pioneers, Indians, and their skills
- Make up stories

With your guidance, the children can do things they enjoy and learn about their natural environment at the same time. Provide the kinds of experiences that let them use their five senses (sight, smell, taste, hearing, and touch), use numbers, measure, make assumptions, classify, communicate, experiment, and put together models.



NATIVE AMERICAN
FISHING WITH A SPEAR

WHAT TO CONSIDER FOR HIKES AND FIELD TRIPS

Hiking with children is rewarding and challenging. This section will help you think of things to consider to have safe, enjoyable experiences.

Before You Leave:

- Select a site. Always have a destination. A goal is an important motivation, and everyone will feel successful when it is completed. You may select the site if the group is young or you have something specific in mind. You could give an older, more experienced group some alternatives, with a committee making the decision.
- If you have chosen a hiking area, try to prehike it to determine its features, whether the group can handle it, and what kinds of things they could explore there.
- Other factors to consider in selecting a hike are budget, transportation, time, weather, terrain, aititude, scenery, available water, and the need for map and compass.
- Obtain information on the area you will visit from local park and recreation districts, national wildlife refuges, private landowners, national forests, state parks, or the Bureau of Land Management. U.S. Geological Survey maps are available at outdoor equipment stores.
- Notify parents of your destination in advance, and the National Forest Service District if it is in a wilderness area.
- Obtain insurance by calling your county Extension office.

Clothing:

Dress appropriately for the season, changing weather conditions, and elevation. Urge kids to try a layering system; i.e, T-shirt, long-sleeved shirt, sweater, windbreaker, and hat. Use raingear, if necessary. Layers can be added and removed, as needed. Clothing should be loose and comfortable. In winter, wool is the best material for warmth when it gets wet.

Footwear:

Feet are your transportation, therefore shoes are important. If the hike is eight miles or less and the terrain smooth, sneakers in good condition are fine. If it is a longer hike in rough terrain, the children should wear boots or hiking shoes that support the ankles, especially if they are wearing backpacks. These shoes must be broken in before the hike. Hikers should always wear athletic-type socks.

Suggested Equipment:

What you carry will depend on the terrain, length of hike weather conditions, etc. Be prepared for any unexpected change of events. It is recommended that you carry the following items in a backpack:

- Map, if trails are not well marked
- Compass
- One canteen of water per person
- Food
- Knife
- Toilet paper and small plastic shovel
- Matches in a waterproof container
- Small flashlight
- First aid kit
- Safety pins, for a number of uses
- Field notebook (other nature books)
- Pen or pencil
- 25¢ for an emergency phone call
- A camera and binoculars are optional.

The children may want to carry their own daypacks to put extra clothing and lunches in.

Hiking Foods:

These should be light, easily carried items that don't require cooking. High energy snacks plus a light lunch are the best combination for a day hike. Some hiking snacks are dried fruit, gorp (dried fruit, granola, candy, nuts), carrots, fruit, beef jerky, candy, and cookies.

Peanut butter and jelly (or honey) sandwiches, or cheese, sausage, and crackers make a good lunch. In cold weather bring hot chocolate, soup, or hot tea. Remember that rigorous activities require more carbohydrates. Carry any trash out of the hiking area. For overnight hikes, help a committee plan menus for the group.

Procedures While on Hikes:

Select a front and back leader. Children can take turns being the leaders during the trip. The front leader is responsible for finding the way, watching for dangers and changes in the trail, setting the pace, finding resting places, and noting interesting things. The front person should keep a pace that is as fast as the slowest person in the group. That person should be right behind the leader. The back leader keeps the group together and stops if there are problems.

Both leaders should watch for fatigue, hot spots leading to blisters on feet, and the proper use of clothing. It is better to be cool on the trail than overdressed and perspiring. Rest stops are important. One good method is to set a steady pace for 30–50 minutes and then take a 5-minute break. If the group is exploring along the way, the hike should be shortened so that frequent breaks don't tighten up muscles.

OUTDOOR MANNERS

Your group should practice good outdoor manners. Encourage them to follow this code:

Don't litter. Pick up litter left by others.

Use trash cans.

Be careful with fire. Make campfires that leave no trace.

Respect wildlife. Don't disturb the animals or their homes.

Stay on trails. Avoid shortcutting.

Avoid cutting green trees.

Properly dispose of body wastes.

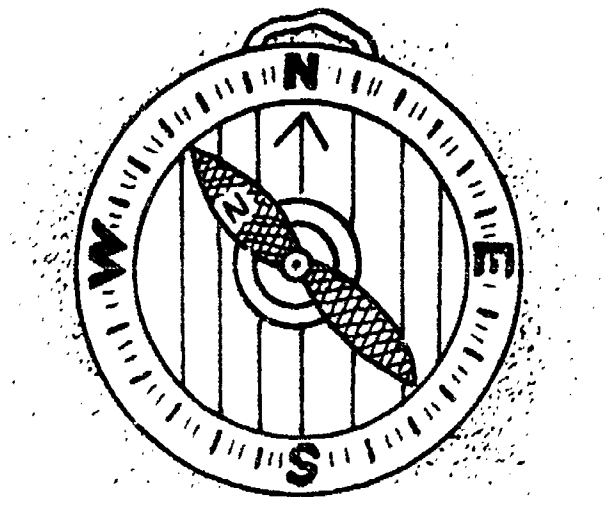
Close fences.

Don't throw rocks in streams or ponds.

OUTDOOR SAFETY

Safety is the most important concern you have. As a Leader, you are responsible for the safety of your group.

What You Should Know	*Activities That Will Help*
1. Your group, their physical capabilities, judgment, and ability to cooperate	1. Play games involving teamwork, cooperation, and building self-esteem.[15,16]
2. How to administer first aid	2. Take a first aid course.
3. The area you are hiking	3. Prehike the area.
4. The hiking distance and how long it will take	4. Start with short hikes, until you know the group better.
5. What to do in an emergency	5. Discuss an emergency plan with the group. Test them by role-playing an accident.
6. What outdoor clothing to use in various weather conditions	6. Visit an outdoor equipment store with the group. Examine clothing for different weather and terrain conditions.
7. How to recognize and safely avoid or negotiate physical and climatic hazards	7. Check out local weather and snow conditions prior to outings. Have a plan for dealing with lightning storms.
8. How to control and pace a group while hiking	8. Place the slowest person right behind the front leader. Develop a "buddy system."
9. How to read a map and use a compass	9. Practice map reading and set up a practice compass course in your neighborhood.
10. What to do if a person or the group gets lost	10. Have a lost hiker exercise, role-playing what to do.



KEEPING A FIELD NOTEBOOK

Any pocket-sized, blank book will work well as a field notebook. It should also have a way to attach a pencil. A special notebook with a clip pencil attached, or a hardbacked clipboard are good alternatives.

Take all notes on the spot. It is difficult to recall details later. Keep your notes simple. A picture or rough sketch is worth a thousand words. Cultivate the practice of observation. Learn to see things not ordinarily noticed. Write down what you see, avoiding interpretations based on inadequate information. Be sure your observations are accurate. Carefully identify all species, using nature field guides. After each field trip, ask the group to share what they have recorded.

RESOURCE LEARNING ACTIVITIES

This section is divided into eight resource areas: Air, Energy, Forestry, Marine, Range, Soil, Water, and Wildlife. The activities in each area are arranged in order of use.

It is recommended that your group complete at least eight activities, using four different resource areas.

ACTIVITY 1

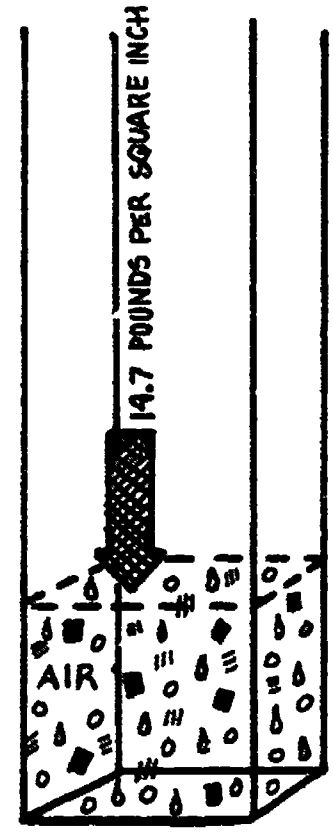
AIR HAS WEIGHT AND TAKES UP SPACE

Site: Indoors.

Objective: To show that air has substance.

Materials: Balloons, two equal lengths of string, wire coat hanger, small glass, and a bucket.

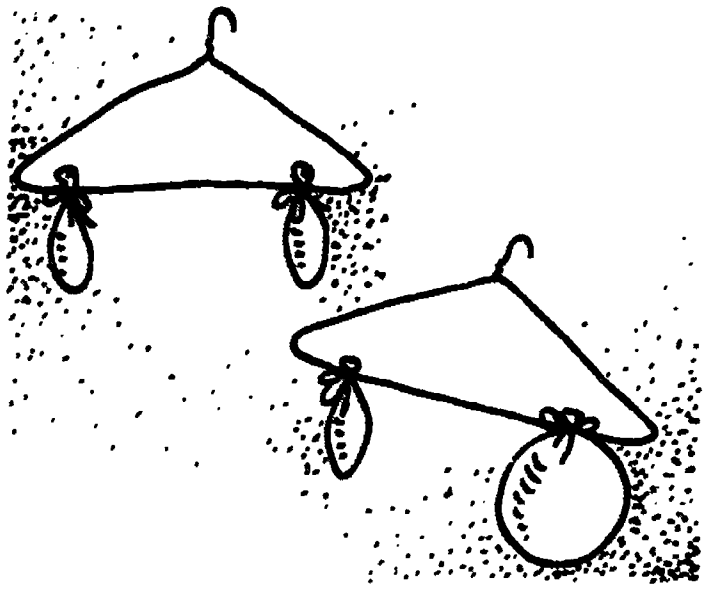
Background: Air has weight. Your body and everything around you is under the pressure of a column of air over 1000 miles high. That column of air weighs 14.7 pounds for every square inch of surface at sea level. As you travel higher in elevation or altitude, the air weighs less because it is thinner.



Air takes space. The amount of space taken up by a certain amount of air is called its volume. We can measure the volume of air in cubic inches, yards, pints, quarts, or metric units.

Steps:

1. Attach two balloons of equal size and weight to two corners of a wire coat hanger with equal lengths of string. Balance the coat hanger. Remove one balloon, blow it up, and attach it again to the coat hanger. Which balloon is heavier? How does this show that air has weight?

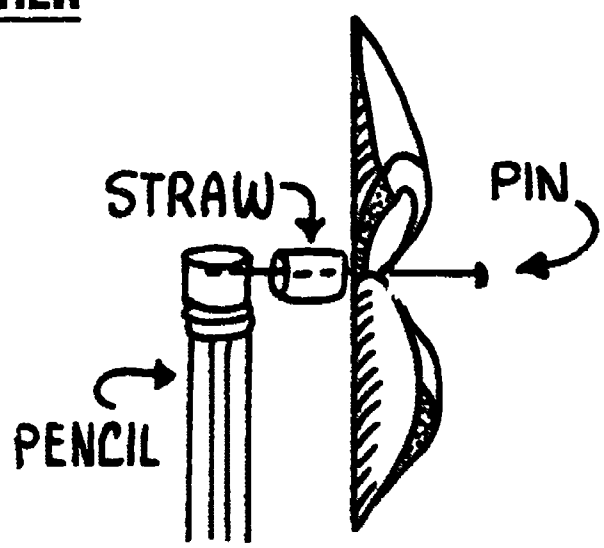


2. Hold a small glass upside down inside a larger jar of water. Why doesn't the water enter the glass?

3. Push an inflated balloon into a full bucket of water. Why does the water overflow?[1]

ACTIVITY 2

WIND WATCHER



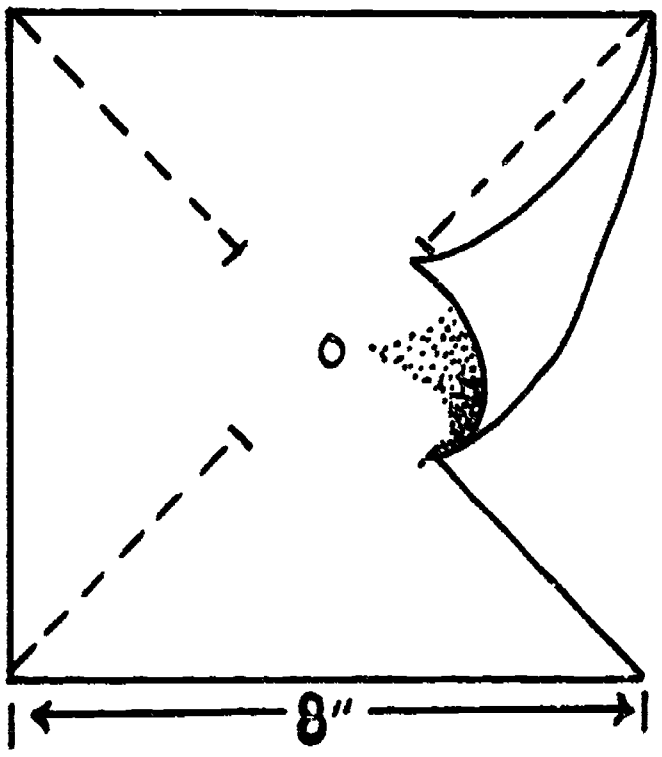
Site: Indoors and outdoors.

Objective: To see the effects of air in motion.

Materials: Construction paper, straight pin, pencil, plastic juice bottle, stick, and a tack.

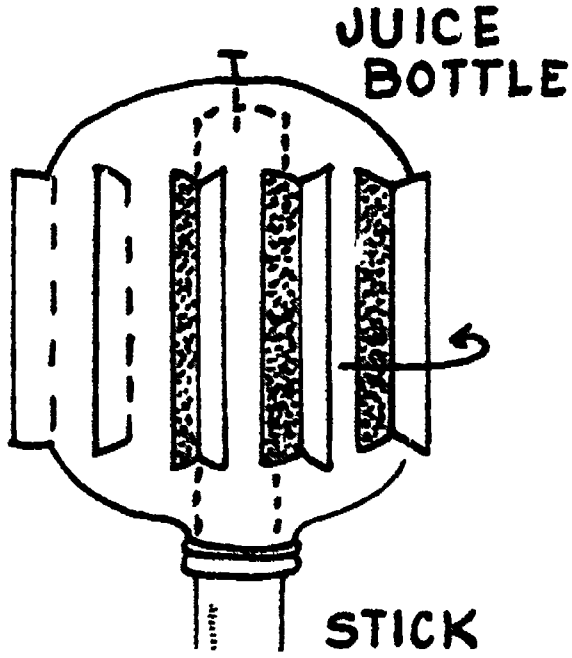
Steps:

1. *PINWHEEL*. To make a pinwheel, cut a piece of construction paper into an 8-inch square. Find the center of the paper by drawing a line from one corner of the paper to the other corner. Cut from each corner into the middle, stopping 2 inches from the center. Fold in every other corner to the center of the square and fasten them with a straight pin.



Pin the pinwheel to the eraser end of a pencil. A straw placed between the pinwheel and eraser will help the pinwheel turn.

2. *BOTTLE WIND DETECTOR.* Cut slits in the side of a plastic juice bottle and bend the cut parts out to create windmill blades. Center the bottle on a stick and gently push a small tack through the bottom of the bottle into the end of the stick. Use this and the pinwheel to pick a windy spot. The kids may wish to place these wind detectors in their yards after this activity.



3. After testing several sites for wind potential, pick the windiest location. Measure the wind with the Beaufort Wind Scale as best you can. If these things are not available to observe, substitute other objects of equal size and mass. For a week, keep a record of the wind speeds at three different times of the day.

At what time of day do the fastest winds usually occur?[7]

BEAUFORT WIND SCALE

BEAUFORT NUMBER	DESCRIPTION	OBSERVATION
0	CALM (0 MPH)	SMOKE RISES VERTICALLY
1	LIGHT AIR (1–3 MPH)	SMOKE DRIFTS WITH WIND
2	SLIGHT BREEZE (4–7 MPH)	LEAVES RUSTLE—WINDVANE MOVES
3	GENTLE BREEZE (8–12 MPH)	TWIGS MOVE—FLAGS EXTENDED
4	MODERATE BREEZE (13–18 MPH)	BRANCHES MOVE—DUST AND PAPER RISE
5	FRESH BREEZE (19–24 MPH)	SMALL TREES SWAY—CRESTED WAVES FORM
6	STRONG BREEZE (25–31 MPH)	LARGE BRANCHES SWAY—WIRES WHISTLE
7	MODERATE GALE (32–38 MPH)	WHOLE TREES IN MOTION—WALKING DIFFICULT
8	FRESH GALE (39–46 MPH)	TWIGS BREAK OFF TREES—WALKING ALMOST IMPOSSIBLE
9	STRONG GALE (47–54 MPH)	BRANCHES BREAK—ROOFS DAMAGED
10	WHOLE GALE (55–63 MPH)	TREES UPROOTED—MUCH STRUCTURAL DAMAGE
11	STORM (64–72 MPH)	WIDESPREAD DAMAGE
12	HURRICANE (73–136 MPH)	DEVASTATION

SCORE CARD			
SUNDAY			
MONDAY			
TUESDAY			
WEDNESDAY			
THURSDAY			
FRIDAY			
SATURDAY			

ACTIVITY 3

WHAT IS IN AIR?

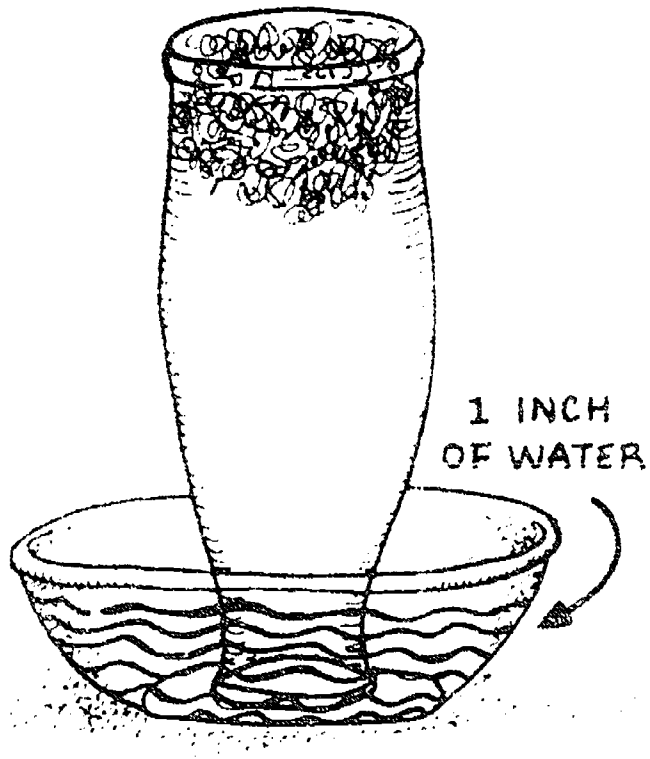
Site: Indoors.

Objective: To demonstrate some things that air contains.

Materials: Clean glass bottle, steel wool, soup bowl, water, two glass custard cups, lime water, straw, tin can, ice cubes, flashlight, deep cake pan, white paper, and a rock.

Steps:

1. Air contains *OXYGEN.* Push a wad of steel wool down to the bottom of a bottle. Fill the bottle about half full of water and shake it well, until the steel wool is very wet. Pour out the water. Put one inch (2.54 cm) of water in a soup bowl. Now put the bottle, mouth down, into the bowl and leave it for 24 hours. The water will rise up into the bottle. The steel wool will become rusty. The steel wool, combined with oxygen in the air inside the bottle, formed rust. The water then rose to take the place of the oxygen in the air that was used up by the steel wool.



2. Air contains *CARBON DIOXIDE.* Put a small amount of lime water into two clear custard cups. Using a straw, blow into the lime water in one cup. The carbon dioxide from your breath will make the lime water milky. Place a second cup of lime water in the fresh air for a few hours. Watch what happens. Whenever carbon dioxide meets lime water, the lime water becomes milky.

3. Air contains *WATER VAPOR.* Get a tin can which has had the top smoothly removed. Remove the label and scrub the can with steel wool until it is bright and shiny. Fill it half full of cold water. Add two or three ice cubes. Soon, droplets of water will form on the sides of the can. When warm air meets the cold sides of the can, the water vapor in the air changes back into droplets of water.

4. Air contains *DUST.* Pull down the shades in a room, switch off the lights, and turn on a flashlight. Little specks of dust will be dancing in the beam of light. (You can often observe dust particles in a ray of sunlight coming through a window.)

5. Air contains *SMOKE AND SOOT.* Cut out a piece of white paper so that it fits the bottom of a deep cake pan. Place the paper in the cake pan, and put a rock on the paper to keep it down. Put the pan outside on a windowsill so that outside air can reach it. After a day or two, see how much smoke and soot has collected.

6. All air has oxygen, carbon dioxide, water vapor, dust particles, and smoke and soot. Discuss the impacts of these things (good or bad) on people, animals, plants, and people's property.[1]

ACTIVITY 4

BEACH SCAVENGER HUNT

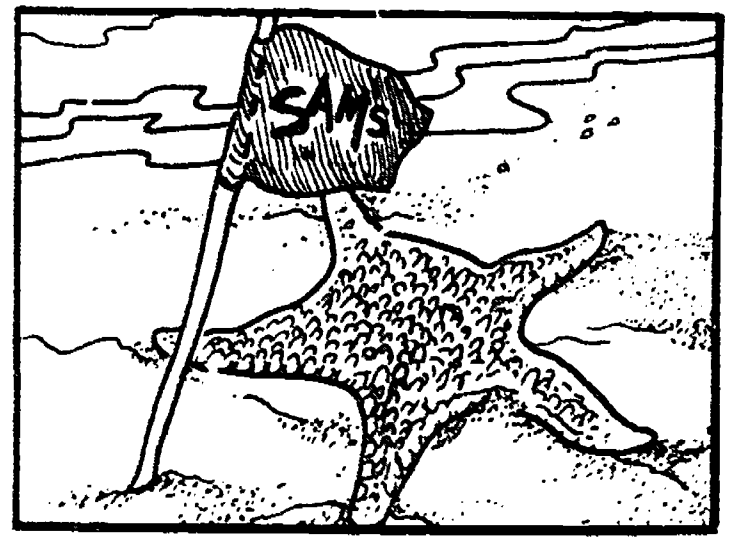
Site: Rocky coast, salt marsh, estuary, or oper. beach.

Objective: To collect and identify beach objects, without disturbing the environment.

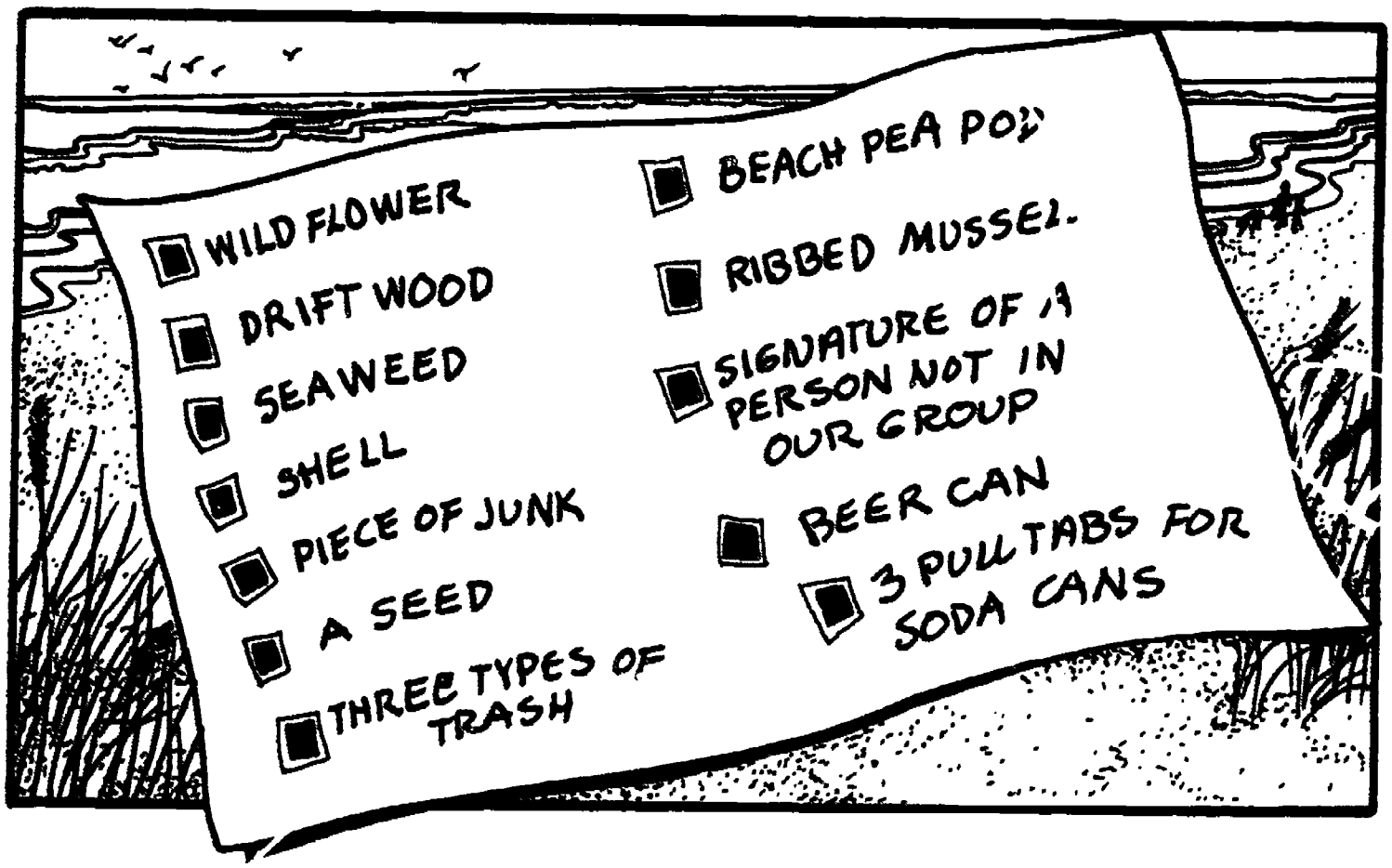
Materials: Flags to be placed near beach organisms to identify the finder and the object. You need as many flags per individual as there are living objects (by using flags marine life can be left undisturbed).

Steps:

1. Have the children find as many things as possible on the list below. Place a flag next to a living organism to mark its location and identify who found it. Collect the flags after the scavenger hunt.



Note: This list can be adapted to your area. List things that are likely to be found on your beach. Have good beach etiquette—put back any rocks that you turned over, and put any garbage in a trash container. [2]



ACTIVITY 5

OBSERVING THE SALTWATER ENVIRONMENT

Site: Rocky coast, salt marsh, estuary or open beach.

Objective: To make and record observations of nature using all five senses.

Materials: Field notebook, pencil, hand lens, and a shallow white or shiny dish.

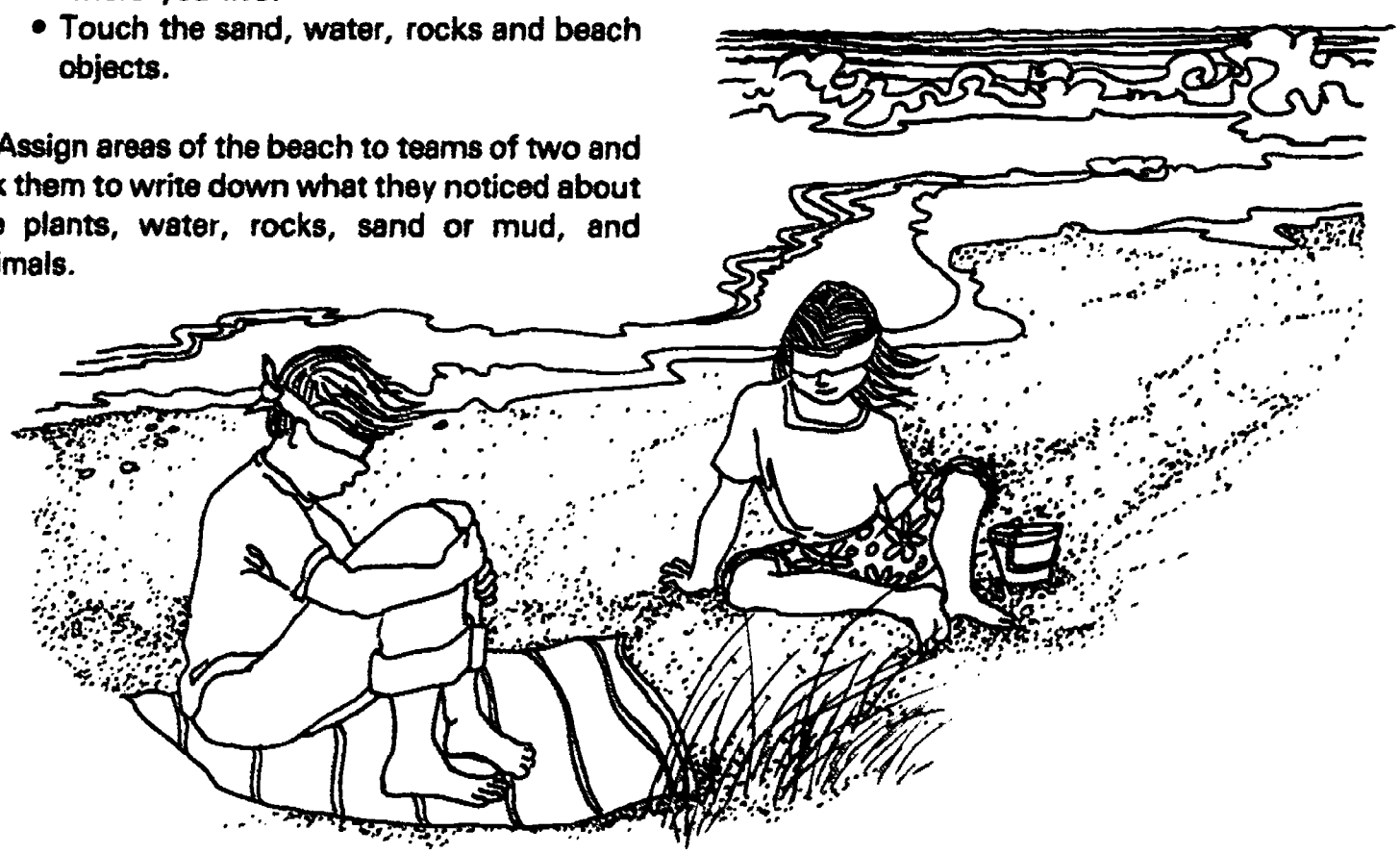
Steps:

1. Have the kids do the following activities on the beach:
   - Walk or sit on the beach blindfolded, listen to the sounds and identify them.
   - Stake the water level every 10 minutes.
   - Throw a ball or piece of driftwood into the water to determine the current direction.
   - Taste the water (only on safe beaches).
   - Smell the air. Is it different than the air where you live?
   - Touch the sand, water, rocks and beach objects.

2. Assign areas of the beach to teams of two and ask them to write down what they noticed about the plants, water, rocks, sand or mud, and animals.

3. Bring the group back together and talk about what they found.

4. Would this area look different at low tide, high tide, during a storm, on a sunny day, at night, in the winter, or during the summer?[2]



ACTIVITY 6

FISH PRINTING

Site: Indoors.

Objective: To make a fish print and learn fish anatomy.

Materials: Fish (fresh or frozen), ink (water soluble block printing ink, acrylic, etc.), paper (gravestone rubbing paper, rice paper, or construction paper), and a small paintbrush.

Background: The Japanese art of fish printing is called GYOTAKU ("GYO" means fish, "TAKU" means print). The Chinese began making fish prints over 600 years ago to record fish catches. It was developed into an art form by the Japanese.

Steps:

1. If the fish are to be used right away, wash them and pat them dry. For use later, wash, dry, and freeze fish in plastic bags—defrost approximately two hours before use.

2. With a small brush gently paint one side of the fish with ink. Make sure all areas are covered, including the fins. Use very little ink. Brush against the "grain" of the scales so ink will accumulate in these areas and make a better print. Most people use too much ink the first time so you will have to experiment.

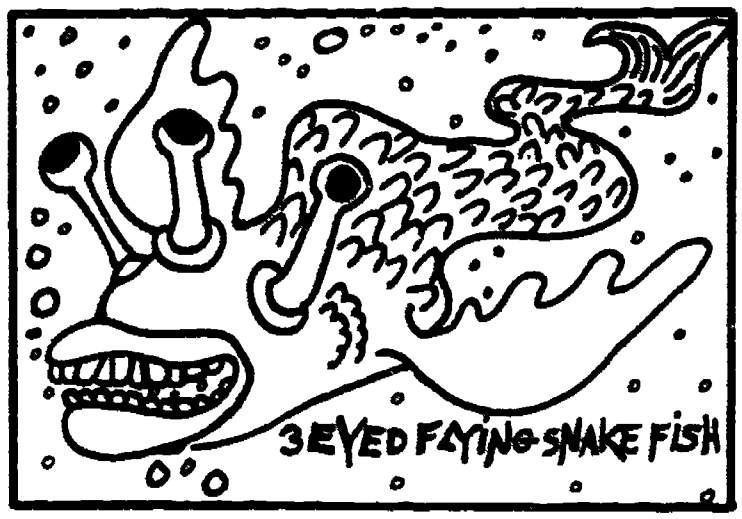
3. Take paper and gently, but firmly, press down on the fish. Rub evenly over all areas, especially head and fins. Do not move the paper while pressing.

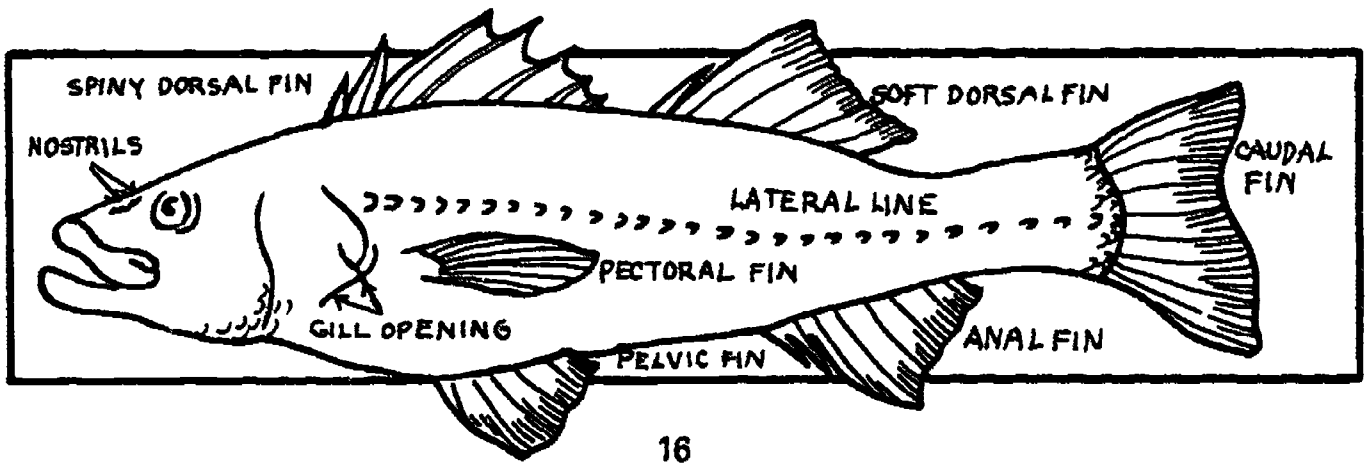
4. Carefully lift the paper up, making sure you don't move the fish and smear the print.

5. Sign the print. Give the name of the fish and the date. Various papers and inks can be used. Experiment with papers of different absorbency. Fish can be washed, dried, and reused. Generally, the thicker the ink and thinner the paper, the better the print. Try using different colors of ink on various areas of the fish.

6. When the group is done making fish prints, wash and dry a fish, then dissect it. Discuss the parts of the fish, including the digestive and reproductive systems.[6]

7. Have the group design and draw imaginary fish. Experiment with colors, shape of body and fins, and the size and location of eyes and mouth. Have everyone explain how their imaginary fish is different from ordinary fish.[5]





ACTIVITY 7

SOLAR HOT DOGS

Site: Outdoors in the summer.

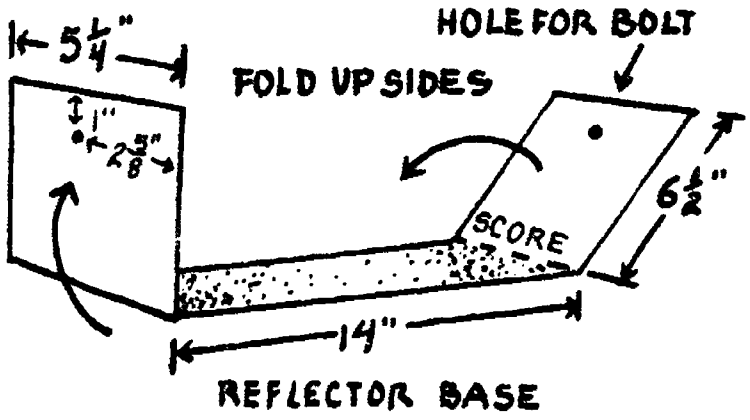
Objective: To demonstrate the heat energy produced by the sun.

Materials: Piece of heavy cardboard (5¼"x 27") for base, piece of thin cardboard (13⅞" x 14") for reflector back, piece of heavy cardboard (8" x 10") for reflector sides, unpainted coat hanger, two 2" x ¼" stove bolts and nuts, aluminum foil, thermometer, tape, pliers, scissors, and rubber cement.

Background: The sun is the most important of all energy sources. Most other forms of energy originate from the sun. Without the sun, there would be no life on earth. Energy directly from the sun can be used to heat homes, produce electricity, and cook food.

Steps:

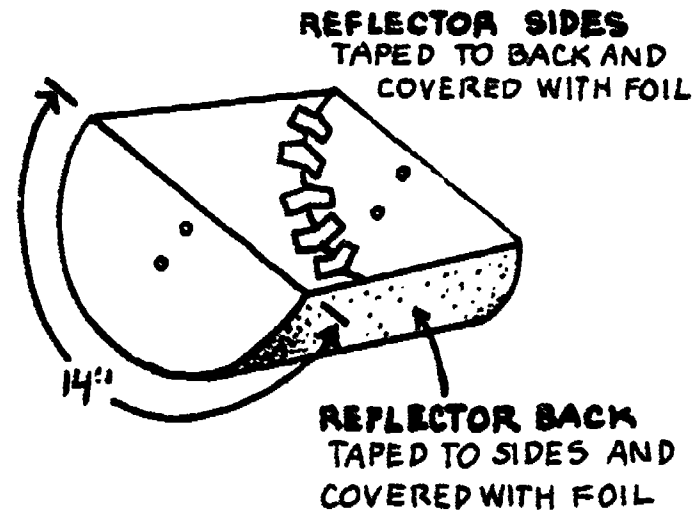
1. Measure 6½ inches from each end of the base cardboard and fold up. Make a hole in the base as shown.



2. Trace the reflector side pattern provided with this activity onto cardboard and cut out two of them. Punch holes in each side as shown on the pattern.

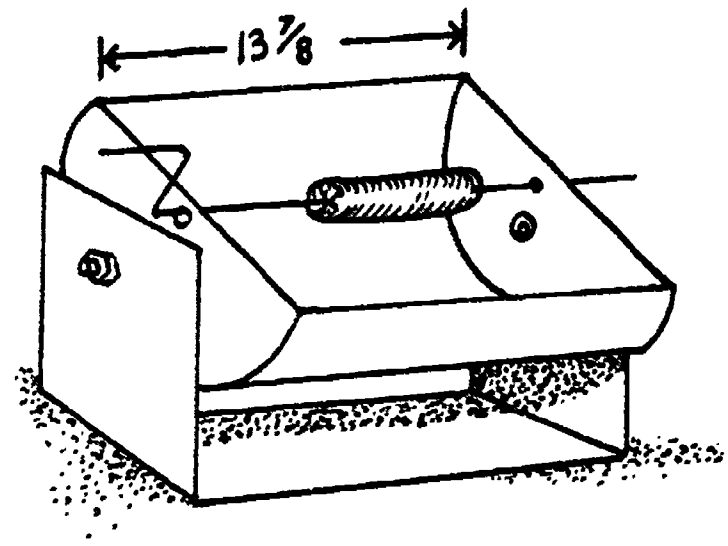
3. Tape reflector sides to reflector back to form a reflector dish.

4. Glue aluminum foil to reflector dish—shiny side out.



5. Cut a skewer from a coat hanger as shown. Bend one end of the skewer with pliers to form a hand crank. Put skewer through reflector sides.

6. Assemble reflector to base by placing the bolt through the reflector sides and base sides.



7. Put the skewer through the hot dog. The end of the skewer then goes through the other side of the reflector.

8. Adjust the cooker by pointing the reflector directly toward the sun. When the most amount of light possible is focused on the hot dog, tighten the nuts on the bolts to hold the reflector at the correct angle. Measure the following temperatures:

SKEWER ___ AIR ___ = SOLAR COOKER TEMPERATURE

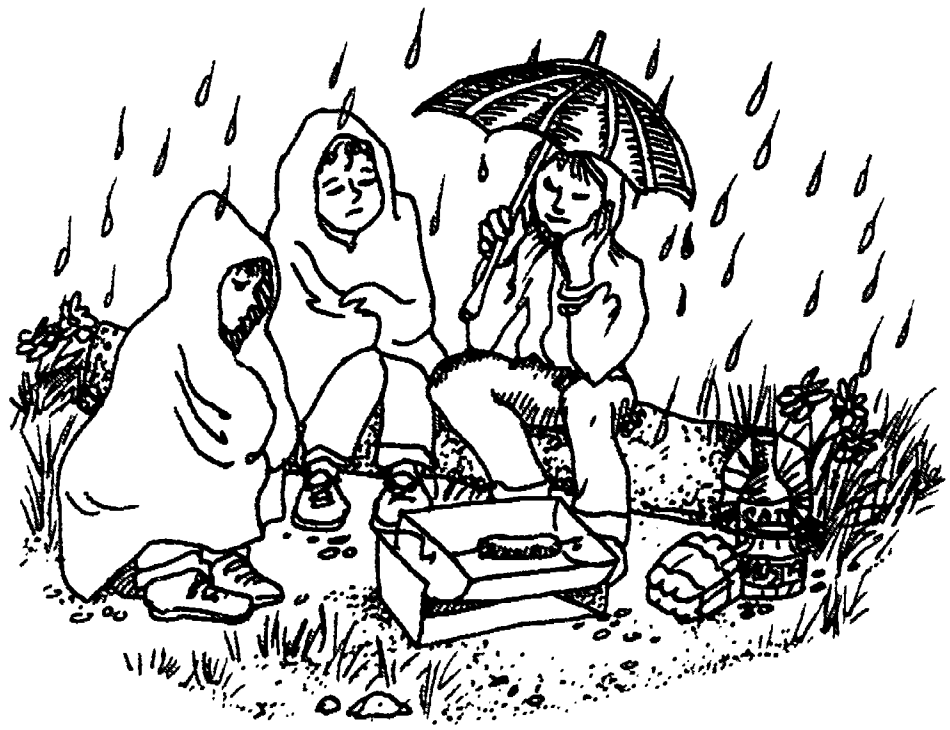
9. Cook the hot dog until it is quite warm. The time it takes to warm the hot dog will depend on the season, time of day, and place.

WHEN IS THE BEST TIME OF DAY TO USE THE SOLAR COOKER?

What else can you cook?

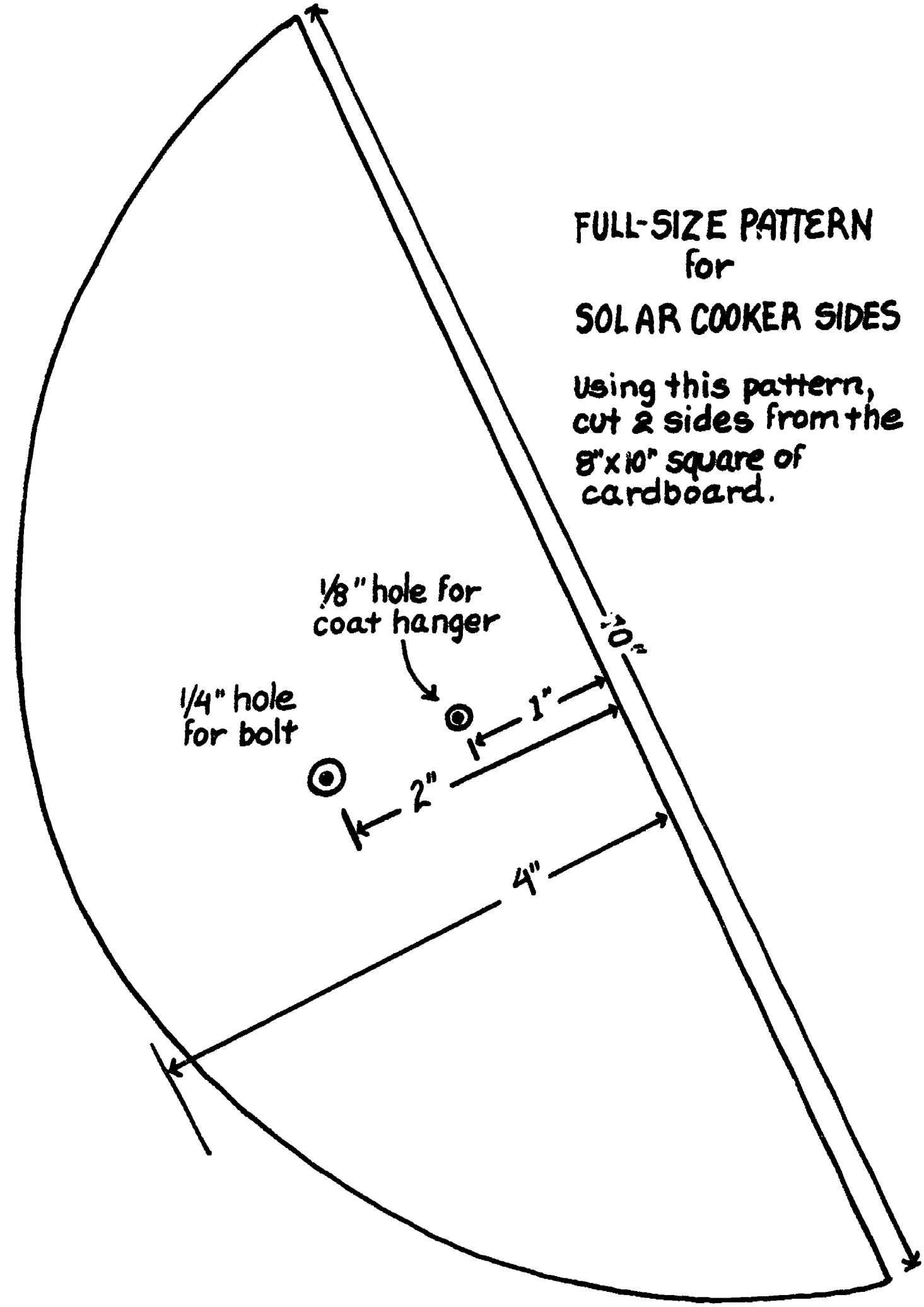
How could you improve THE SOLAR COOKER'S performance?

10. Discuss the good and bad aspects of using solar energy.[7]



FULL-SIZE PATTERN for SOLAR COOKER SIDES

Using this pattern, cut 2 sides from the 8"x10" square of cardboard.



ACTIVITY 8

CASH FOR TRASH

Site: Indoors.

Objective: To learn to save energy by recycling aluminum.

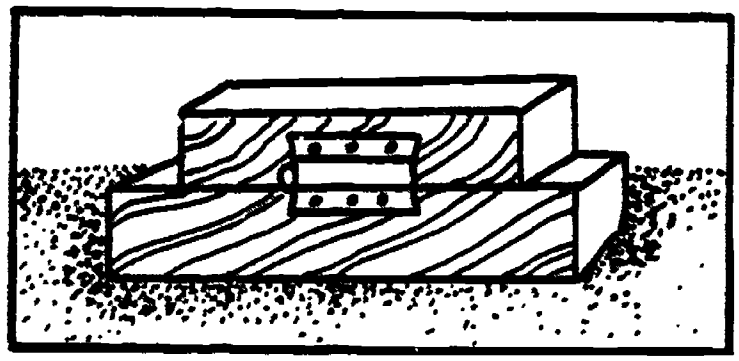
Materials: 2 boards, one 2' x 6" and one 2' x 4", heavy-duty door hinge, 6 flathead hinge screws 1½", screwdriver, lag bolt ¼" x 1½", pencil, magnet, and a drill or a hammer and nail.

Background: Recycling saves energy. It takes a lot of energy to turn trees into paper, sand into glass, iron ore into steel, and bauxite into aluminum. Energy is saved when paper, glass, steel, and aluminum are used again. Recycling aluminum saves 95% of the energy needed to make new aluminum.

Aluminum can companies want to recycle aluminum. They will even pay for used aluminum. It takes 23 cans to make a pound. As long as it's clean, recycling companies will accept most aluminum, including foil, pie plates, TV dinner trays, pudding containers, and meat cans.

Steps:

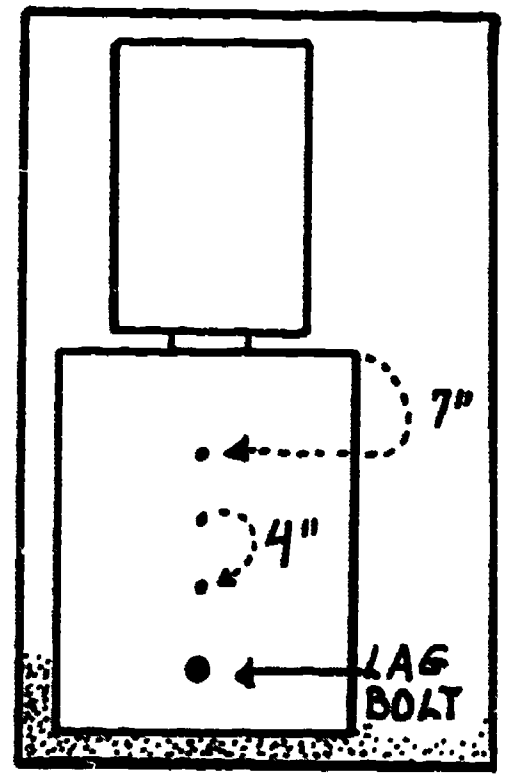
1. Position the hinge on the two boards. The hinge bolt loops and hinge bolt extend beyond the end of the boards. Trace the screw holes, and drill them. Attach the hinge to the boards.



2. Drill 4 or 5 lag bolt holes down the center of the baseboard. Place them 4" apart and start them 7" from the hinge end of the board. The lag bolt keeps the cans from sliding out when you crush them.

Many cans are made with steel. Use a magnet to see if the cans are steel, as magnets are not attracted to aluminum.

3. Visit a recycling center with the group, taking the cans you have collected and crushed.[7]



ACTIVITY 9

USING COAL, OIL, AND GAS AS ENERGY FUELS

Site: Indoors.

Objective: To understand the formation and extraction of coal, oil, and gas and their roles as energy fuels.

Materials: Blotter paper, heavy weights, crackers, clear plastic cups, large sandwich bags, rubber bands, twist-ties, vinegar, baking soda, green leaves or plants, and a small glass jar with screw-top lid.

Background: From 75 to 95% of all the fuel used in the U.S. is fossil fuel. The formation of coal involves the decomposition, under heat, of masses of organic materials, primarily from plants. Coal is formed at low temperatures and takes millions of years. Crude oil and gas are becoming increasingly difficult and expensive to recover.

Petroleum (oil) and gas are formed in the same manner, but require pressure as well as heat. Petroleum and gas that are fluids can move upward until they reach the surface of the ground. However, they are often trapped in sand-like material underground. People often think that oil lies in big pools beneath the surface of the earth, but actually tiny droplets adhere to sand or rock particles and are forced out by pressure within the earth or by man-made pressure. The site where oil is found is seldom where the oil originated. The oil and gas continue to seep through permeable rock or sand until they reach an impermeable structure, such as caprock. Unless a crack in the caprock permits the oil to travel further, it remains trapped.

Often, oil and gas are trapped together, but sometimes gas escapes through microscopic openings where oil cannot travel. This explains why oil is sometimes discovered but no gas is found. Geologists use a seismic method to determine the presence of oil. This entails firing small charges of explosives and then recording the reflected sound waves to determine the nature of the earth formation. If a caprock is present it increases the likelihood of oil.

Steps:

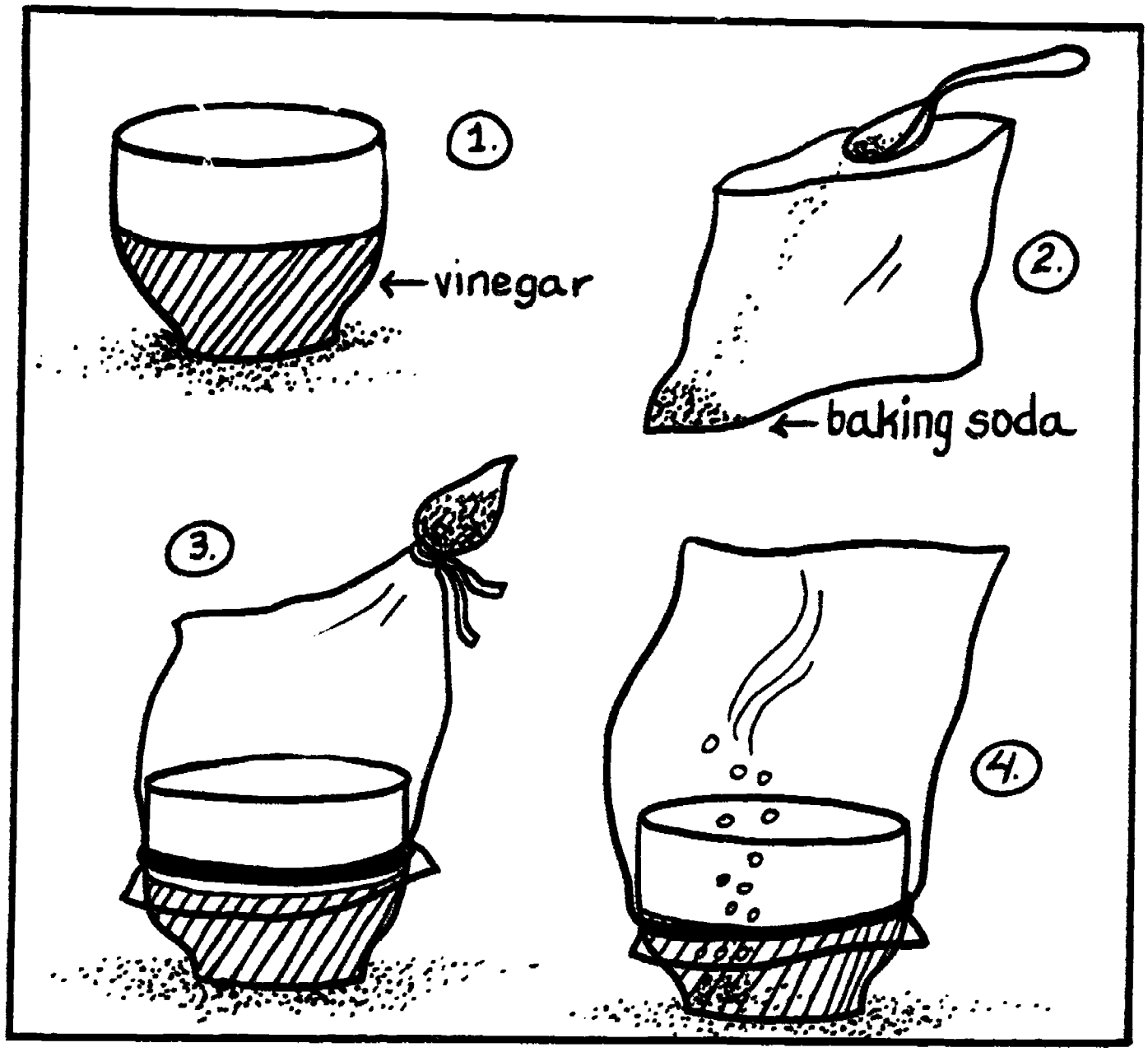
1. *COAL.* To illustrate how coal is formed, stuff a small, glass, screw-top jar full of green leaves, or soft green plants. Screw the lid on tightly and set aside for several weeks. Do *not* open the jar! What happened to the leaves? Adding heat to this process would produce coal.

2. *OIL.* To understand how oil deposits form gradually, place several crackers that have a buttery feel between sheets of blotter paper. Next, place a heavy weight on top. When the group examines the paper after a few days, it will see that a minute amount of oil has moved into the paper, just as oil moves into sand.

3. *OIL.* To illustrate the movement of oil, place a small amount of colored water in a clear jar. Pour white sand on top of the water and watch as the colored water moves up into the sand.

4. *GAS.* Unlike oil, gas in its pure form, cannot be seen, smelled, or tasted. In the formation of gas, two elements combine and the resulting interaction produces gas. The following experiment combines vinegar and baking soda to produce carbon dioxide gas. It is an analogy that illustrates the gas formation process. Fill a cup halfway with vinegar. Secure one teaspoon of baking soda

inside a corner of the plastic bag with a twist-tie. Place the mouth of the bag over the cup's opening and seal with a rubber band. Then release the soda into the vinegar. The mixture will bubble and give off carbon dioxide gas, which inflates the sandwich bag. If these materials are used, the experiment is harmless. However, do not try it in a glass container because the gas might shatter the glass.



5. Have the children identify petrochemical products used at home (reading product labels may help) and find pictures of products that are made from petroleum. Examples are cosmetics, medicine, synthetic fabrics, plastics, oil and gasoline, lipstick, food preservatives, tires, fertilizer, vinyl, styrene food packages, paints, asphalts, aspirin tablets, and nose drops.

ACTIVITY 10

PATTERNS IN NATURE

Site: Outdoors.

Objective: To be aware of patterns in nature.

Materials: Field notebook, pencil, and crayons.

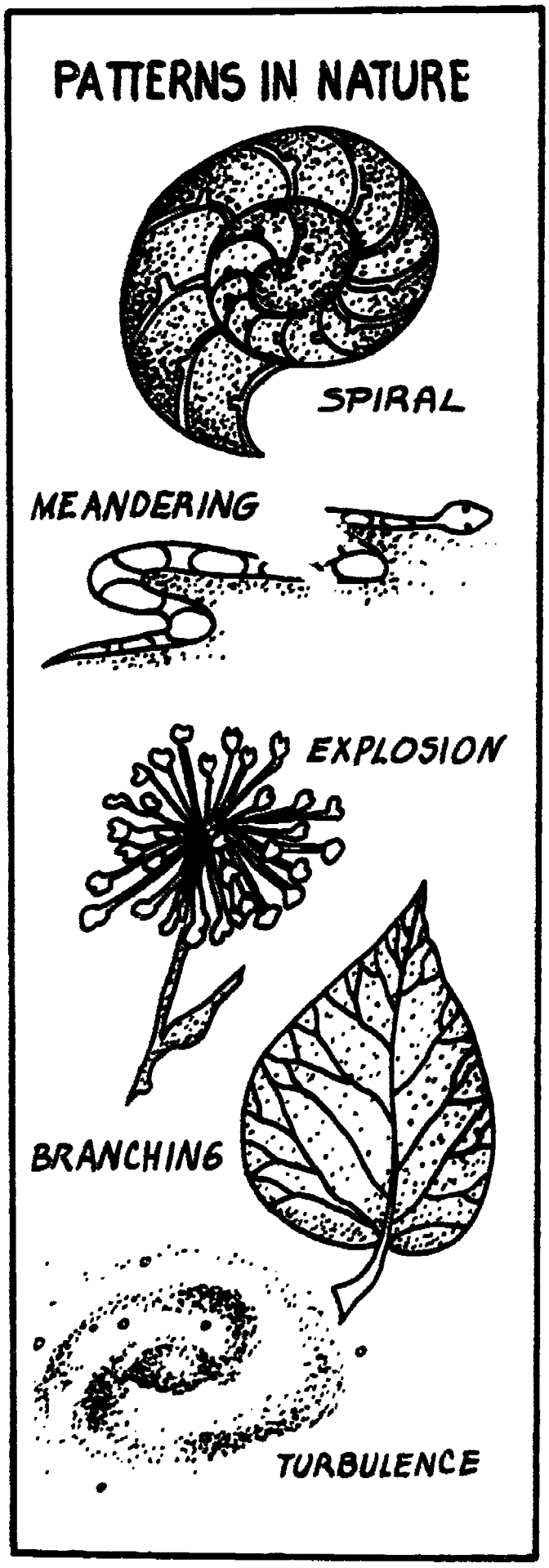
Background: Patterns are all around us. In our homes we decorate the walls and other objects with patterns, and arrange objects and rooms in ways we find useful and beautiful. We plant our yards, gardens and crops in patterns. At school or in an office, objects or tasks are arranged in a pattern that makes the work more efficient. Automobile factories pattern the assembly line so parts can be fitted together in the most productive manner. We have taken from nature the idea of using patterns in our work and homes to make our lives more enjoyable.

Steps:

1. Discuss what a pattern is.

2. Take the children on a silent nature walk through a field or wooded area. Have them use paper, pencil, and crayons to record the patterns of colors, shapes, arrangements, and designs they observe. Compare their observations, and look for repetitions in nature. Why might these colors, shapes, arrangements, and designs be repeated? Are they useful to the object or organism?

Extension: The kids can look for patterns in nature around their homes, record them in their field notebooks, and share them with the group at a subsequent meeting.[17]



ACTIVITY 11

SEED DISPERSAL

Site: Forest area, field, or meadow.

Objective: To identify methods of plant seed dispersal.

Materials: Old socks or pieces of cloth.

Steps:

1. Take the group to a field or forest and have them collect seeds. One method is to put socks over their shoes and walk around. Or they could drag a cloth over the ground.

2. See if the kids can identify the ways that seeds are dispersed. Explain the different dispersal methods including airborne, clinging, dropped, and propelled.

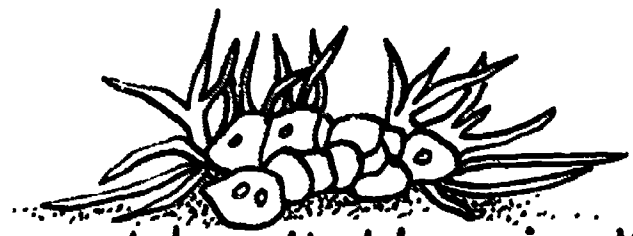
3. Divide the group into teams of 3-5 to classify the seeds by the way they are dispersed.

4. Have a group discussion about the following:

- What physical characteristics do the seed types have to help them disperse?
- Why must seeds be dispersed?
- What are the ways one seed might be dispersed, and what value might there be for seeds to be dispersed in more than one way?
- How far could a seed go? Can some go farther than others?
- Why might traveling farther be a good thing?[17]

winged seed carried by the wind

seed carried by the water



seed deposited by animal's scat

burr like seeds carried in animal's fur

Resource: Trees of Washington.[20]

ACTIVITY 12

LEAVES AND NEEDLES

Site: Forest.

Objective: To discover that leaves have different sizes and shapes and be able to identify trees by looking at their leaves.

Materials: Field notebook, pencil, crayons, Describing Leaves Form, and clear tape.

Steps:

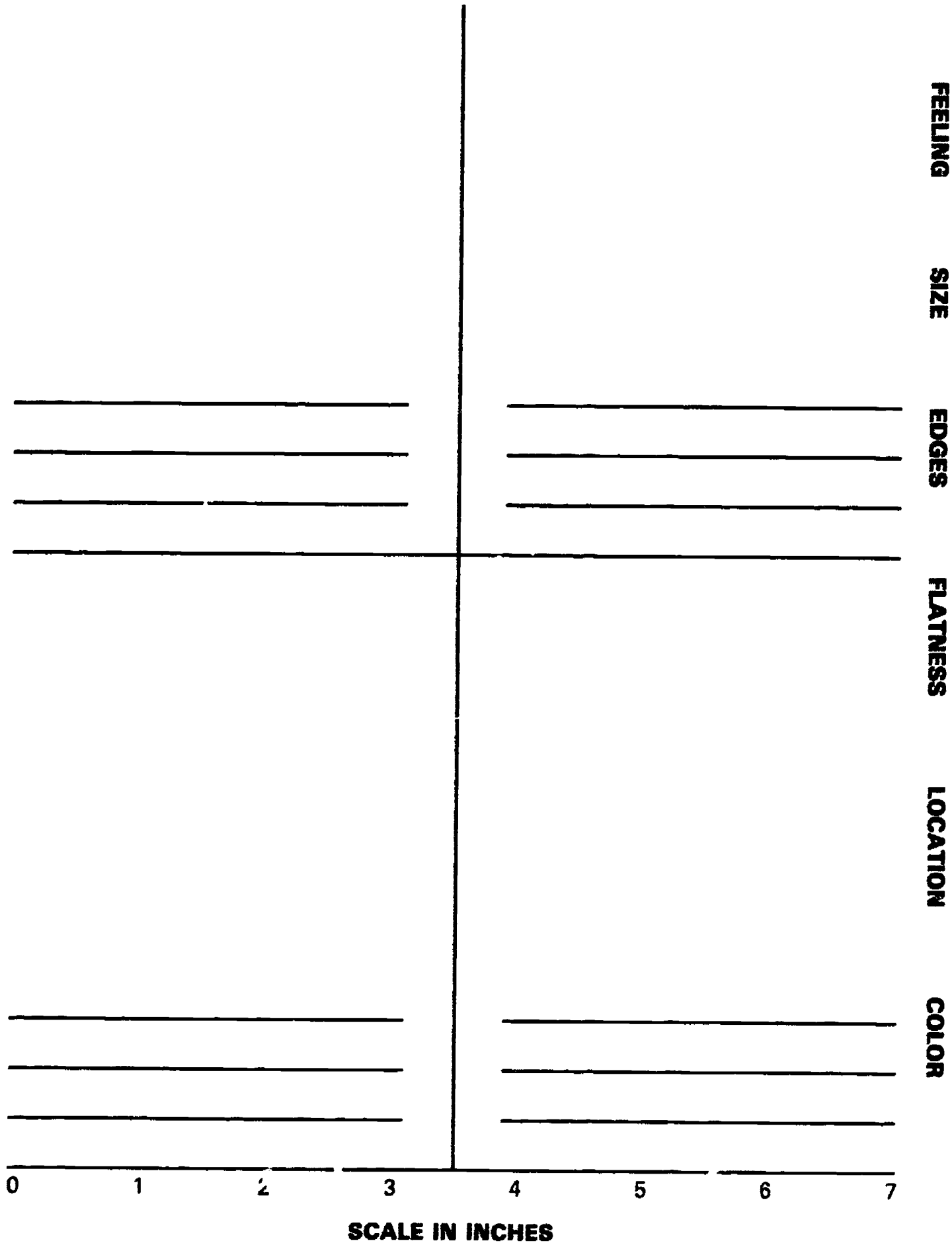
1. Have everyone look at the leaves and needles of broadleaf and conifer trees at the site. Have them make tracings or rubbings of leaves in their notebooks. Explain the different characteristics of leaves.

2. Explain the Describing Leaves Form by using a leaf to show what the words on the border mean. Show them how to write a description of the leaf on the form.

3. Give forms to the kids and have them each collect four types of leaves. Have them tape the leaves to the form and write a description of each leaf.

4. Discuss the characteristics of each leaf collected. Why do some trees have broad leaves, while others have needles? See if everyone can identify the trees using *Trees of Washington.*[20]

DESCRIBING LEAVES FORM



ACTIVITY 13

URBAN LAND, FARMLAND, FORESTLAND, RANGELAND

Site: Indoors and/or range.

Objective: To become familiar with different kinds of lands and their importance to humans.

Materials: Instamatic or regular camera, or magazines containing outdoor pictures.

Background: There are four main types of land in most of the United States, urban land, farmland, rangeland, and forestland.

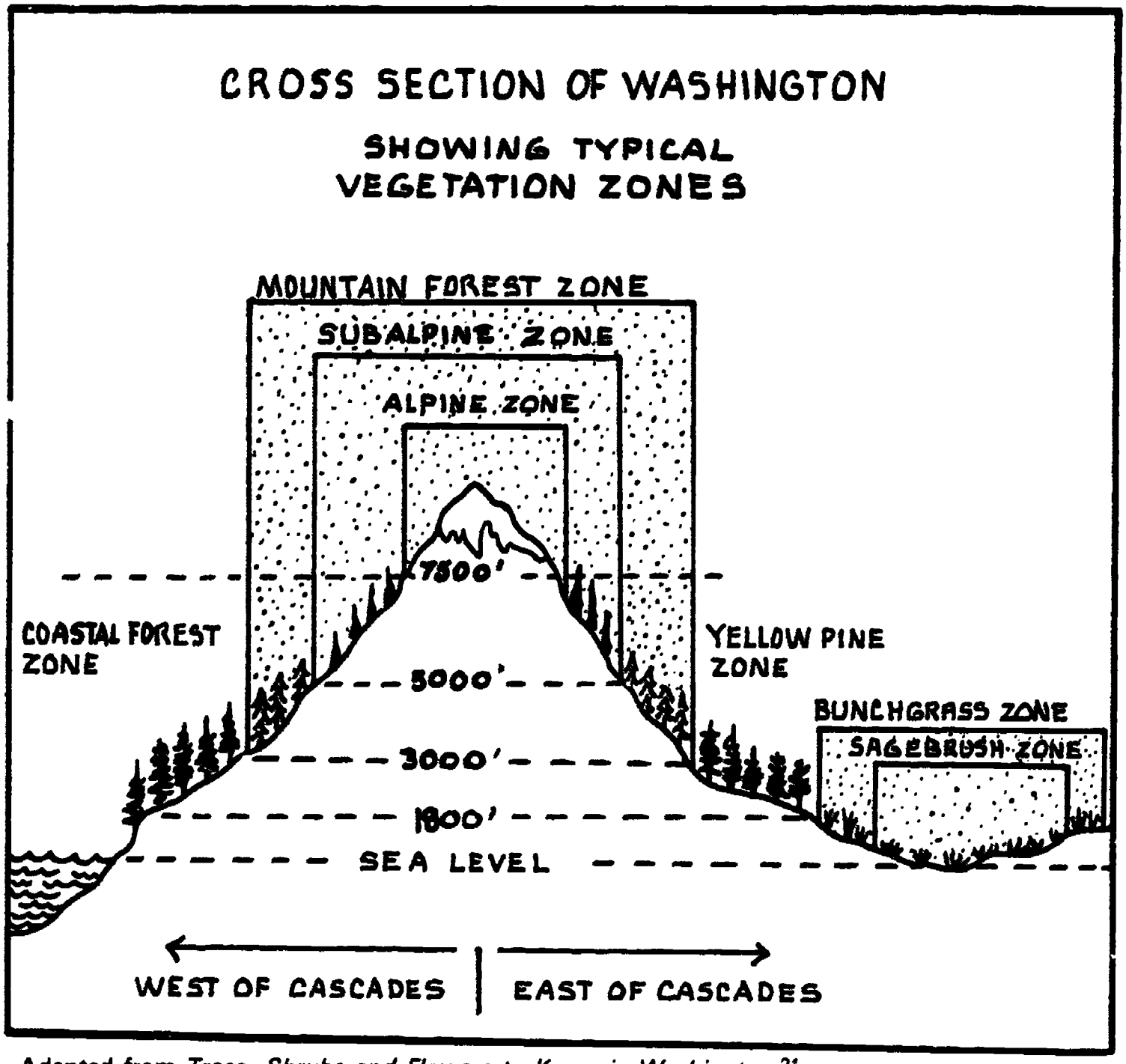
- *URBAN LAND* contains cities. Cities have factories, homes, airports, stores, schools, and churches. Most of the soil in cities is covered with buildings and streets, sidewalks and parking lots. Ninety-seven percent of all the people in America live in cities and towns. Although all city people need clothing to wear, food to eat, water to drink, and wood products for their homes, it is impossible to produce enough of these things in a city. Therefore, cities must import resources from farms, ranches, and forests.
- *FARMLAND* grows crops like wheat, corn, potatoes, alfalfa, fruits and vegetables, and produces most of our food. However, combines, tractors, fertilizers, fuel, herbicides, and trucks are needed to produce crops. Therefore, farmland is an important source of food, but it requires large quantities of oil, gas, electricity, and machinery from factories.
- *FORESTLAND* has trees, grass, meadows, water, wildlife, timber, and is used for fishing and camping. Before people cleared forests for farms and cities, they covered 60% of the earth's land area. Today forests only cover about 30% of the world's land. Forestland supplies paper and other wood products, cellophane, plastics, rayon, acetate, gums, waxes, and oils.
- *RANGELAND* has grass, cows, horses, ranchers, wildlife, and conservation areas. Rangeland covers about 50% of the earth's land surface, and provides much of our meat, wool and leather. Rangelands are also good places to hunt and fish. The range provides us with these things without requiring vast amounts of fossil fuels. Instead, rangelands produce food for people when livestock eat plants that have captured the sun's energy. Rangeland provides nearly half of all forage for our livestock.

Steps:

1. Take photographs or use magazine pictures of the four types of lands and discuss each one.

   - What do urban areas produce? (Services, machinery, other consumer goods.) What do they depend on from farm, forest, and rangelands? (Food, clothing, lumber, water, electricity, and minerals.)
   - What food does farmland produce? (Cereal grains, hay, fruit, vegetables, poultry.) What do farmers need from cities, forestland and rangeland? (Oil, gas, electricity, machinery, goods, wood.)
   - What do we get from forestland? (Wood, paper, wood by-products, water, wildlife, recreation.) Forestland management requires machinery, fossil fuels, and human resources.

- What do we get from rangeland? (Grassland, beef, lamb, wool, leather, wildlife and recreation.)[10]



Adapted from *Trees, Shrubs and Flowers to Know in Washington.*[2]

ACTIVITY 14

HOME ON THE RANGE

Site: Indoors.

Objective: To consider the special problems of plants and animals in a rangeland environment and their contributions to humans.

Materials: Pictures of rangeland plants and animals.

Background: Rangelands make up more than 40% of the earth's land. Rangeland is dry, steep, or rocky, and cannot be cultivated. It is used to feed livestock and wildlife. Much rangeland is less populated than other places, but although it is usually dry, people still receive many benefits from it.

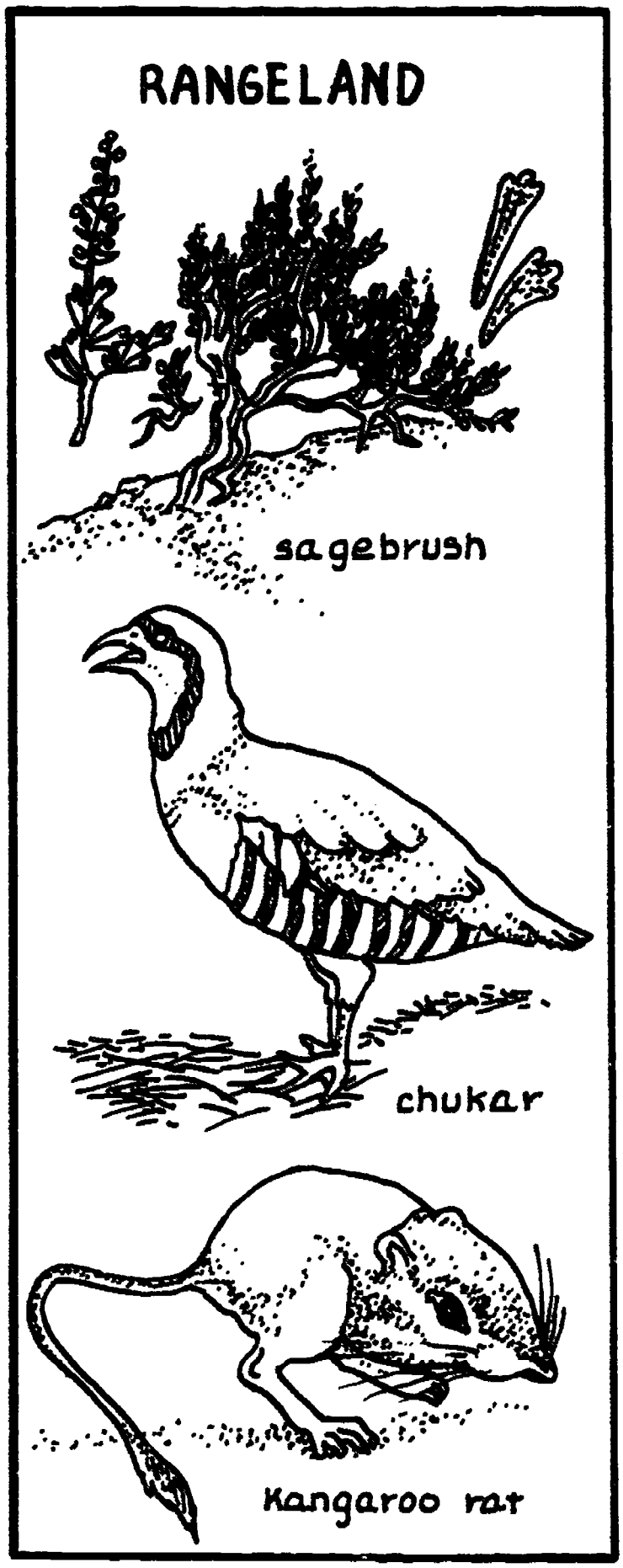
Steps:

1. Have a group discussion about the following:
   - What plants and animals live in rangelands?
   - What special characteristics do these plants and animals have that help them survive with little water?
   - Are these organisms found near your home? Why or why not?
   - What are the main benefits of rangelands to people?

2. Have the group assemble pictures of typical rangeland birds, mammals, reptiles, insects, trees, shrubs, flowers, etc., and construct a "Rangeland Inhabitants" display.

3. Help the children build a rangeland diorama or model for table display.[10]

Resource: Eastern Washington Range Plants.[4]



ACTIVITY 15

OBSERVING THE RANGE ENVIRONMENT

Site: Outdoors in the range.

Objective: To explore the range environment.

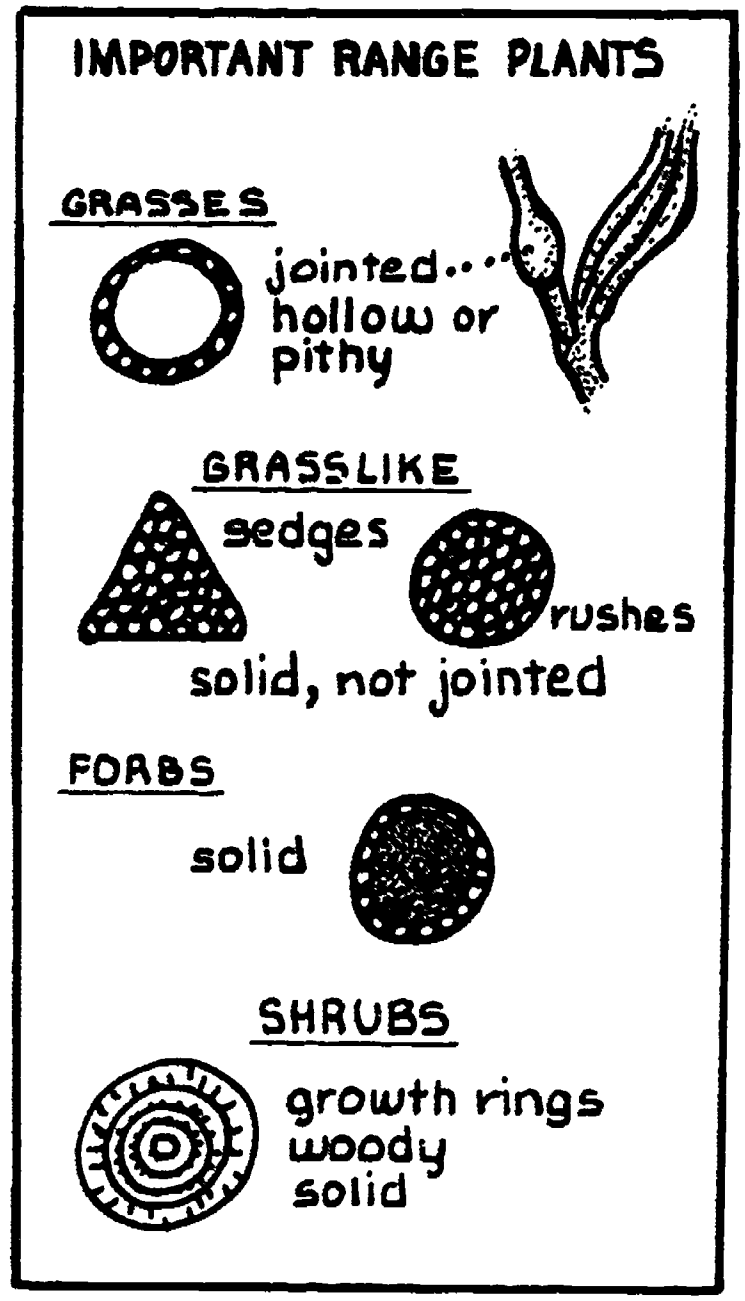
Materials: Field notebook and pencil.

Steps:

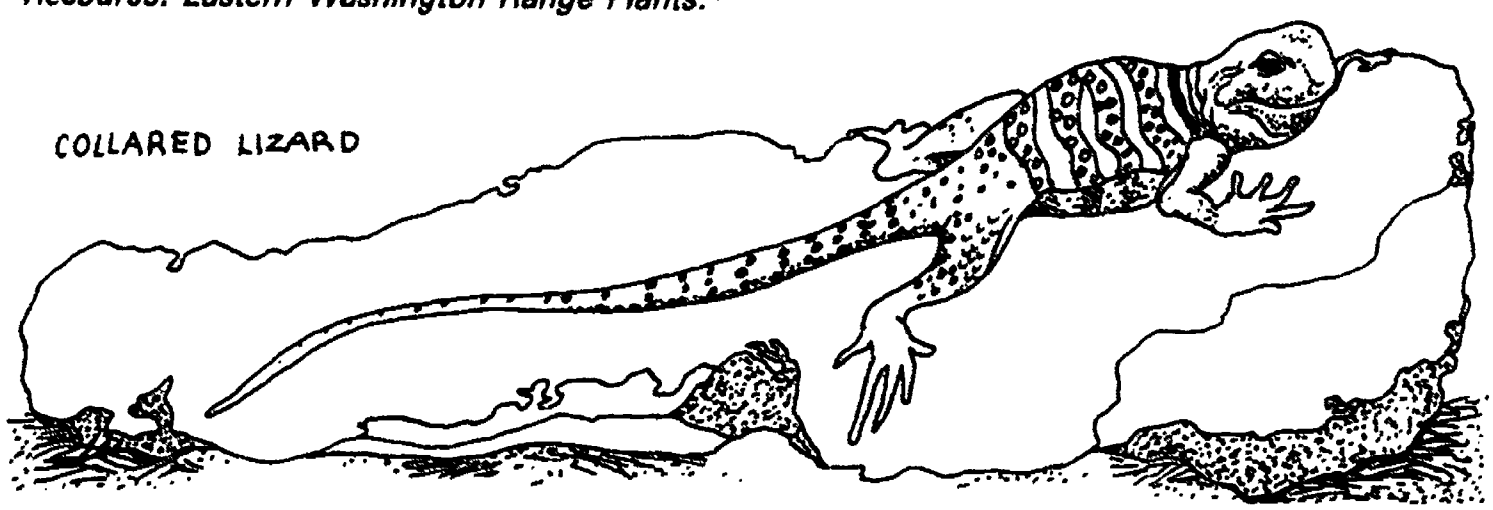
1. Have the group explore a range area. They should write observations about the habitat in their field notebooks. Have them consider the soil, rocks, air, plants, animals, water, weather, and topography.

2. Have a group discussion about the following:

- What did you notice about the plants found here?
- What animals or evidences of animals did you see?
- What is the soil like?
- What are the rocks like?
- Is there any water?
- Describe your general impression of the area?
- Why is this a range and not a forest or desert?
- How would animals protect themselves in this environment?



Resource: Eastern Washington Range Plants.[4]



ACTIVITY 16

LET'S MAKE SOIL

Site: Indoors.

Objective: To show how rocks break down into soil.

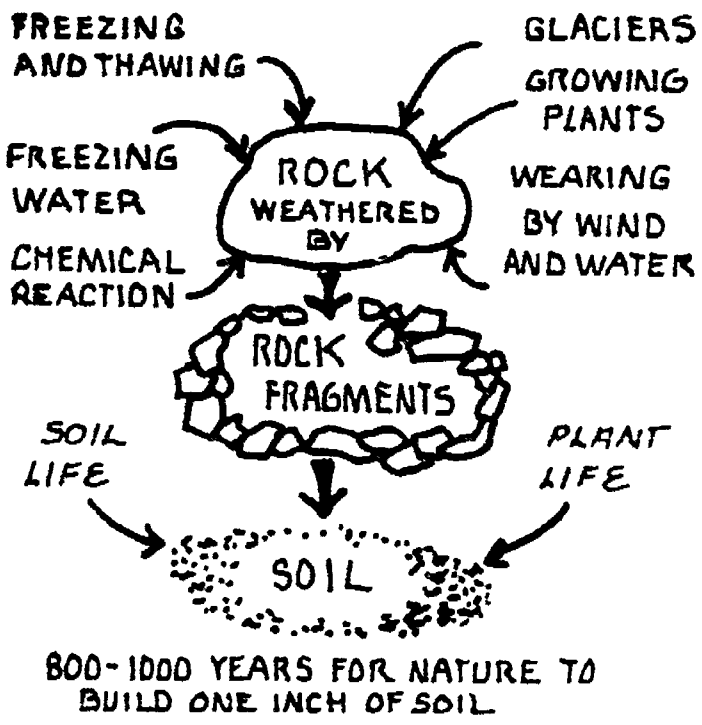
Materials: Two pieces of limestone or sandstone, paper, heat source, ice water, small glass jars, and vinegar.

Background: Soil is formed by:

1) Rocks rubbing together very slowly over thousands of years.

2) Changes in temperature. The expansion and contraction of rocks due to freezing and heating chips rocks. Freezing water expands with tremendous force. Water that finds its way into small cracks freezes and breaks the rocks into ever smaller pieces.

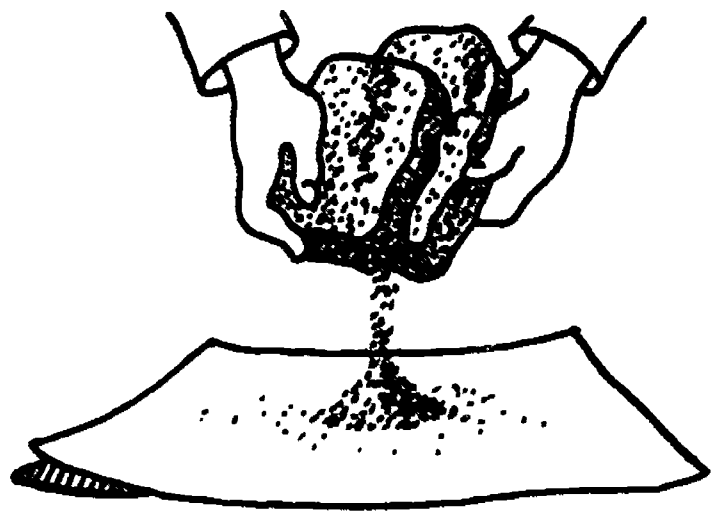
3) Plant acids. A plant's roots take in oxygen and give off carbon dioxide. This gas is one of the important parts of decaying organic materials. It dissolves in soil moisture, forming weak acids. These acids will decompose rock. When you put limestone into vinegar, you are duplicating this process.



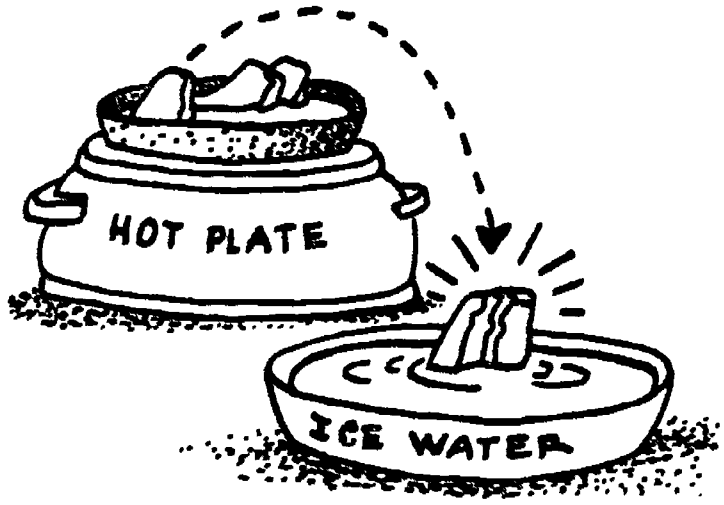
Steps:

Perform the following experiments and discuss the results with the children.

1. Rub two pieces of limestone or fine sandstone together, and collect the small particles of debris on a sheet of paper. If natural stone is not available, pieces of building brick or concrete will do. How long did it take to rub off some particles?



2. Heat a piece of limestone over a flame or on a hot plate. Drop it quickly into a pan of ice water. What happened to the rock? Did it break or crack? Why?



3. Fill a small glass jar with water and put a tight lid on it. Let it freeze in a freezer. What happened to the jar?

4. Put some vinegar in a small pan. Add a piece of limestone, and heat the vinegar on a hot plate or stove. Did bubbles form on the rock? Why?[19]

ACTIVITY 17

SOIL MINERALS

Site: Indoors.

Objective: To show the effects of soil minerals on plants.

Materials: Paper cups, seeds, salt, sugar, soil, crushed rock, and water.

Background: A mineral is a naturally occurring, inorganic, homogeneous substance, such as salt, coal, sulfur, or phosphorous.

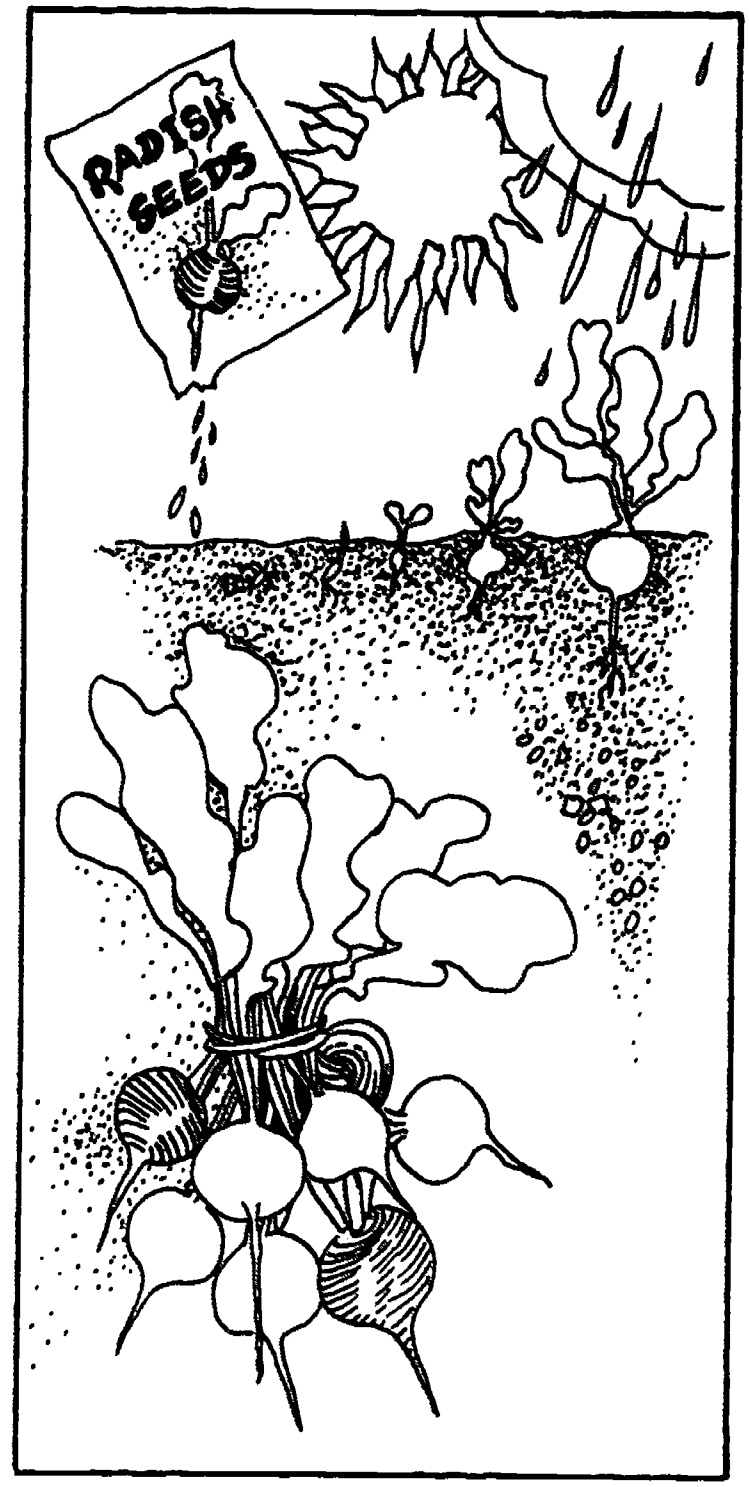
Steps:

1. Put the soil in the cups, and plant the seeds in them. Add a teaspoon of salt to one cup and a teaspoon of sugar to another. In the remaining cups, experiment by varying the amounts of salt and sugar. Leave one cup with just water, soil, and seed. Add water to some, and none or little to others. In another cup, add no soil, use only seed, crushed rock, and water.

2. The next time the group meets, see how the seeds have grown. Discuss the following:

- Is there any difference in the growth of the plants?
- Does the addition of a mineral like salt make a difference to the soil?
- Does a nonmineral like sugar hinder the soil?
- How do fertilizers (added mineral nutrients) affect soils?
- Can soils have too much or too little fertilizer to grow healthy plants?

Extension: Have the kids make their own soil using rocks, sand, organic matter and/or fertilizer, and plant radish seeds.



ACTIVITY 18

SOIL EROSION

Site: Outdoors.

Objective: To demonstrate soil erosion and stability.

Materials: Source of water (hose or bucket), jars, field notebook, and pencil.

Steps:

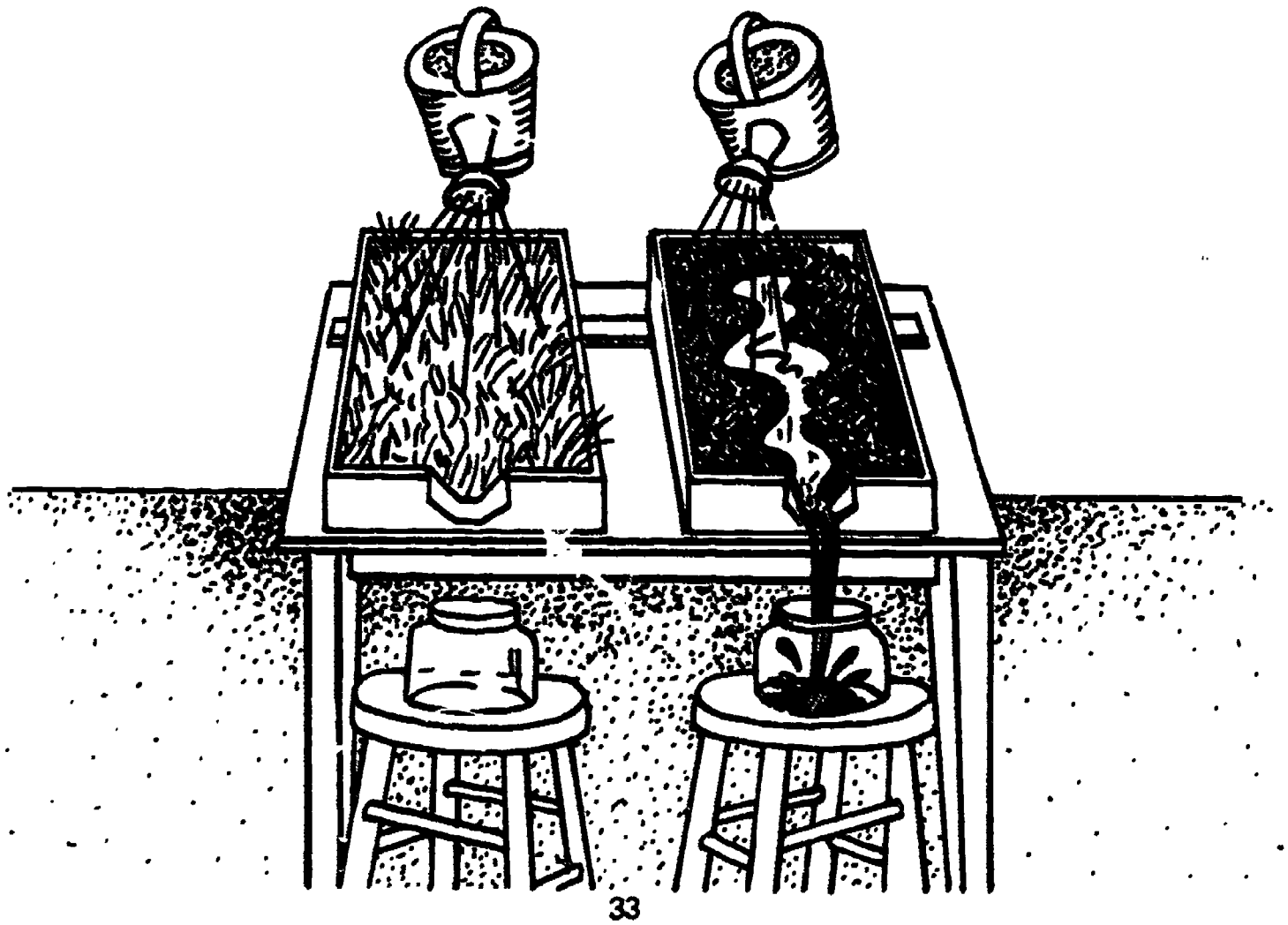
1. Select two equally sloping sites. One site should have bare soil, and the other good vegetation cover. Pour equal amounts of water on the two sites and observe the results.

2. Have a person at the bottom of each slope collect the water in a jar as it comes down. You may need to do this more than once to get good results.

3. Discuss the following:

- How does vegetation affect the rate at which water moves down the hill?
- On what slope did water travel the farthest?
- What happened to any debris?
- How does the slope affect the rate and amount of soil erosion?
- How are the samples in the jars different?
- What might be done to prevent soil erosion?[17]

ANOTHER ACTIVITY OPTION



ACTIVITY 19

WATER WASTE

Site: Home.

Objective: To learn how much water is used and wasted in the home, and how to conserve water.

Materials: Field notebook, pencil, bathtub and shower, faucet, and a bucket.

Background: A dripping faucet can waste 15–20 gallons of water per day. Toilets account for about 40% and bathing and showering about 30% of household water use. If the wasted water is also being heated, both energy and water are going down the drain.

Steps:

Have the children do the following experiments at home, record the results in their notebooks, and report at the next meeting.

1. Take a bath. Fill your bathtub with water as usual, but before you step in, use your yardstick to measure the depth of the water. Record this depth.

Bath depth _____

2. The next time you need to get clean, take a shower. Close the bathtub drain so that the shower water will collect in the tub. When you are finished, step out of the tub and measure the depth of the water.

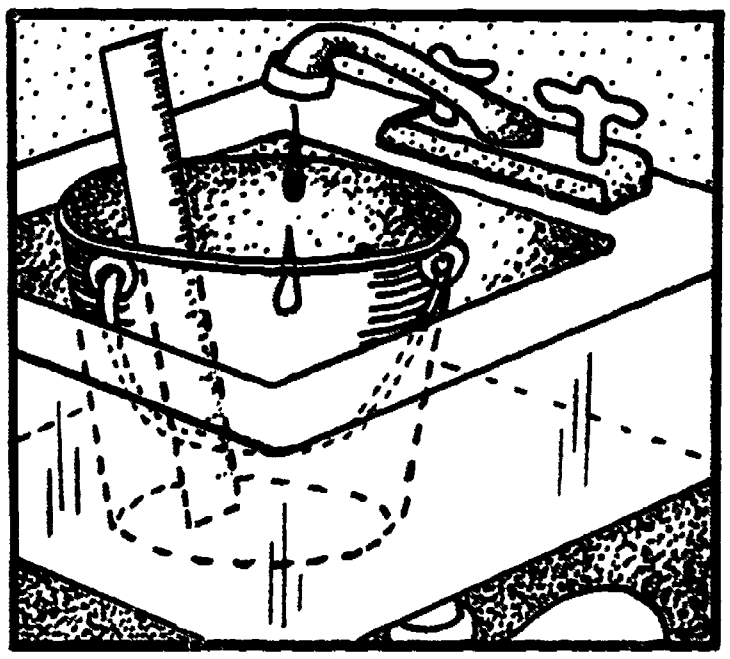
Shower depth _____

3. Compare the two depths. Which used more water, the bath or the shower? Which way of getting clean wastes less water?

Bath _____ Shower _____

4. Locate a dripping faucet or simulate one by slightly turning the water on so it drips. Put a bucket under the drip and measure and record the amount of water that drips into it in one hour. _____ Calculate how much water would be wasted in one day (24 hours) _____, one month _____, one year _____.

Extension: Install a water flow restricter or fix a dripping faucet to save water.[7]



ACTIVITY 20

WATER AND SOIL IN ACTION

Site: Outside, where soil is exposed.

Objective: To identify three types of water erosion, and think about the results of erosion.

Materials: Large buckets or wastebaskets and water.

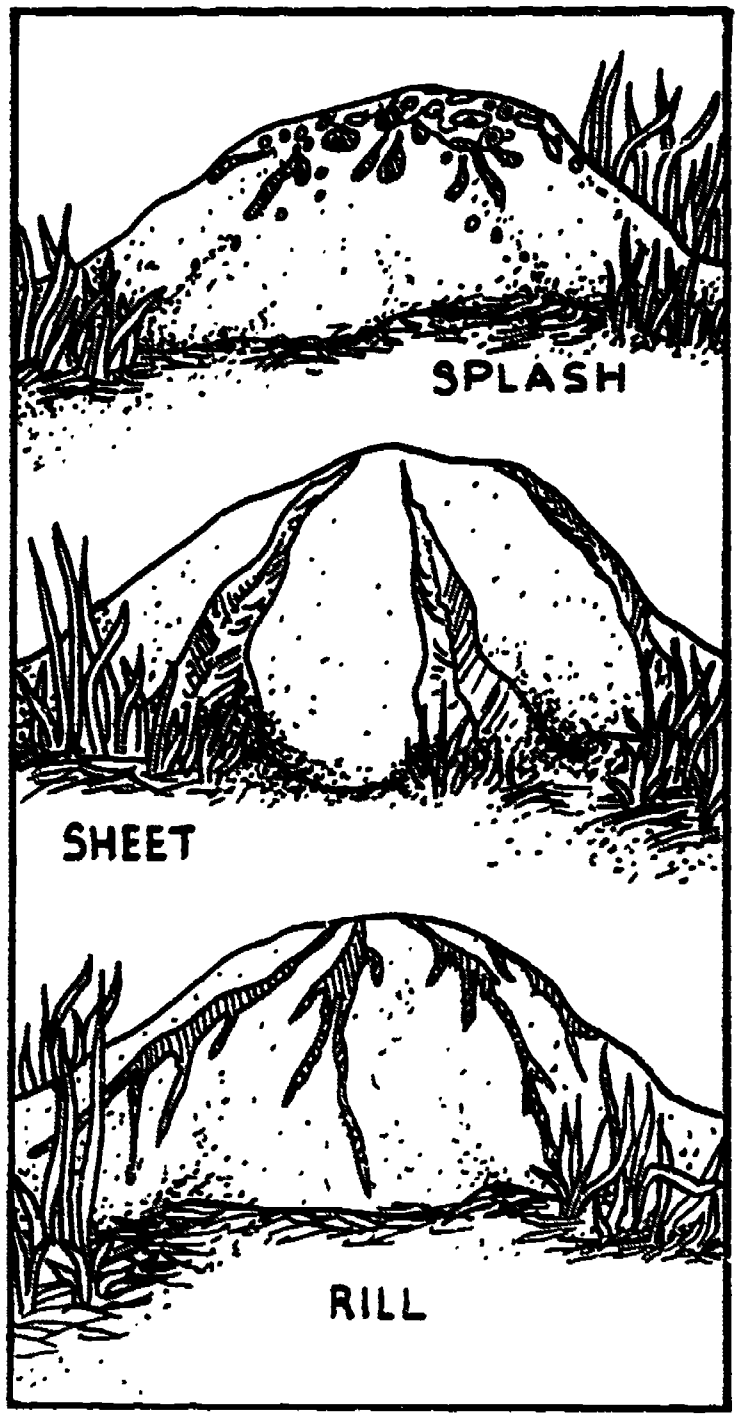
Steps:

1. Help the children demonstrate the following types of erosion:

   - *Splash erosion*. This works well when the soil is either very dry or very wet. Put your hands in the bucket of water and shake them over the soil. Do this until a lot of the soil is wet.
   - *Sheet erosion*. Pour a bucket of water out in a sheet with some force.
   - *Rill erosion*. Pour a bucket of water in one spot.

2. Discuss the demonstrations.
   - What does the water do to the soil?
   - Which type of erosion has the most impact?
   - What would happen if we poured many buckets of water in the same spot?
   - Where is this likely to happen?
   - What does this mean for the different ways we use land, such as farming, grazing, logging or construction?

Extension: Obtain pictures of some young mountain ranges (Cascades, Olympics, etc.), some old mountain ranges (Appalachians), the Grand Canyon, Dry Falls, Cannon Beach, the Badlands, and other dramatic examples of what happens when water and earth interact over long periods of time. Have a discussion about the pictures, including the length of time involved, how different types of soil materials eroded differently, and what sequence of events may have produced these geologic features.[13]



ACTIVITY 21

IDENTIFYING AQUATIC ANIMALS

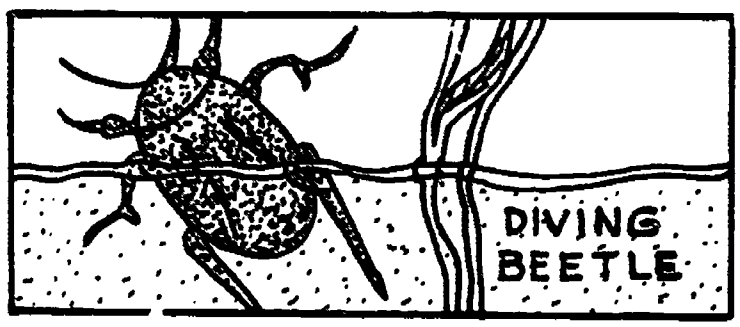
Site: Pond or lake.

Objective: To collect and observe aquatic animals, learn how they relate to their habitat, and how to judge water quality by the number of animals and species.

Materials: Field notebook, colored pencils, crayons, a net, tea strainer, or sieve for each person, clear plastic containers and white pans (one for every three or four people), hand lenses, and pictures of aquatic animals.[11]

Steps:

1. Talk about the things animals need to survive in the water (air, food, protection from predators, breeding area). Have each child draw an imaginary animal living in the water and give it a name. Share the drawings and have each person explain the adaptations of his or her imaginary animal.



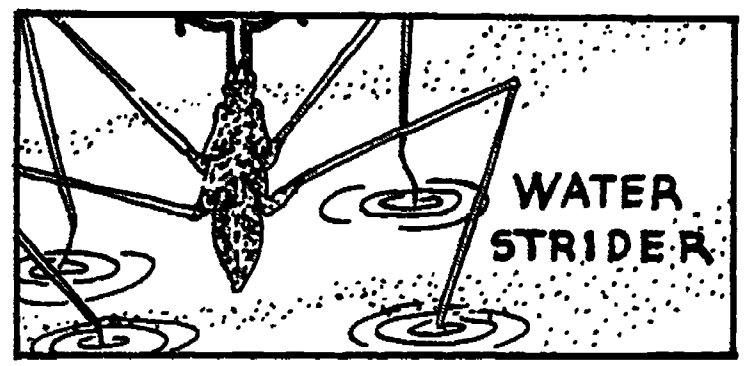
2. Hand out the equipment. The strainers, sieves, and nets are for catching creatures, while the clear plastic containers and white pans are for collecting and observing them. Collecting can be done from the shore or by wading.

Many organisms can be seen on the surface or swimming in the water and are easily caught with a dip net or strainer. Others are more difficult to see. You can find many by turning over floating leaves such as lily pads, or by closely examining the stems and bodies of submerged and emergent plants. In some cases, you may have to pull up some vegetation and rinse it over a white pan.

Bottom-living organisms can be found hiding under submerged logs or stones in shallow water. Catches can be held temporarily in the jars and pans. Use the hand lenses to examine the animals closely.

3. Help the children count and record in their field notebooks the total number of like specimens and separate them into groups based on body shape, the number of legs, and tails. Compare notes on where the animals were found and their movements in and out of the water. Record the animals' characteristics, wings, types of legs, appendages for breathing, color, eggs, number and type of attachments, mouth parts, etc. The total number of individuals, number of kinds, and number of individuals per kind are important in judging the quality of the body of water.

4. Compare the children's drawings with what they actually found. Return all organisms to the water when you are done with them.



ACTIVITY 22

HOW MANY BEARS CAN LIVE IN THIS FOREST?

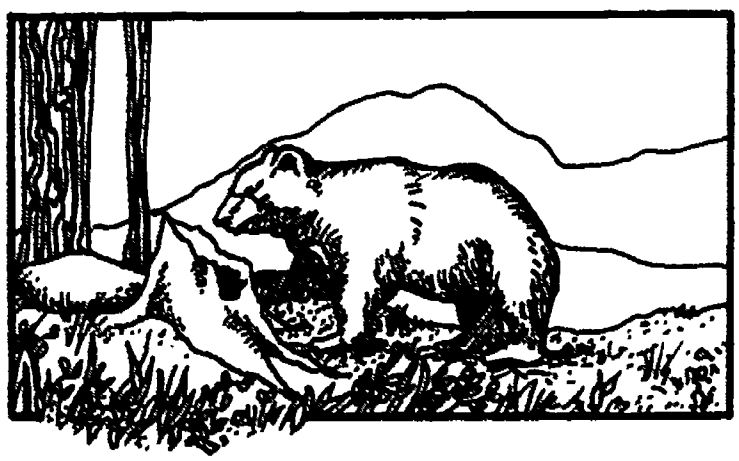
Site: Outdoors in a field.

Objective: To define carrying capacity and understand its importance.

Materials: Five colors of construction paper, about 15 sheets (2-3 sheets of each color) or an equal amount of light poster board, a black felt pen, one envelope per person, pencils, and a blindfold.

Background: Carrying capacity is the ability of a given area of habitat to supply food, water, shelter, and necessary space to a wildlife species. It is the largest population the area can support on a year-round basis, or during the most critical season.

An area of bear habitat can support only a specific number of bears, just as a one-gallon bucket can hold only one gallon of water. All habitats, for whatever species, vary seasonally and yearly in their carrying capacity. Habitats can therefore only support the numbers that can be carried at the lowest ebb of the season or year. Those surplus animals, born during milder seasons, must die due to some "limiting factor" prior to, or during, the harsher season. This activity uses black bears as an example so that children can understand carrying capacity.



Steps:

1. Cut the paper or poster board into 2" x 2" or 2" x 3" pieces. Make one card of each color for each person. For example, for 30 children, make 30 cards of each color and mark them as follows:

   orange—nuts (acorns, hazelnuts, walnuts, hickory nuts); mark 5 pieces N-20; mark 25 pieces N-10.

   blue—berries (blackberries, elderberries, huckleberries); mark 5 pieces B-20, mark 25 pieces B-10.

   yellow—insects (grubs, worms, larvae, ants, termites); mark 5 pieces I-12; mark 25 pieces I-6.

   red—meat (mice, fish, squirrels, beaver, muskrats, deer); mark 5 pieces M-8; mark 25 pieces M-4.

   green—plants (leaves, grasses, herbs); mark 5 pieces P-20; mark 25 pieces P-10.

The color and letter show the type of food, and the numbers represent the amount of food in pounds. The following is an estimate of the amount of food eaten by one bear in ten days, based on a black bear study done in Arizona.

nuts—20 pounds = 25%
berries—20 pounds = 25%
insects—12 pounds = 15%
meat—8 pounds = 10%
plants—20 pounds = 25%
80 pounds = 100% in ten days

Make the appropriate number of food cards for your size of group. There should be less than 80 pounds of food per person so that there is not actually enough food in the area for all the "bears" to survive.

2. Scatter the colored pieces of paper in a fairly large open area.

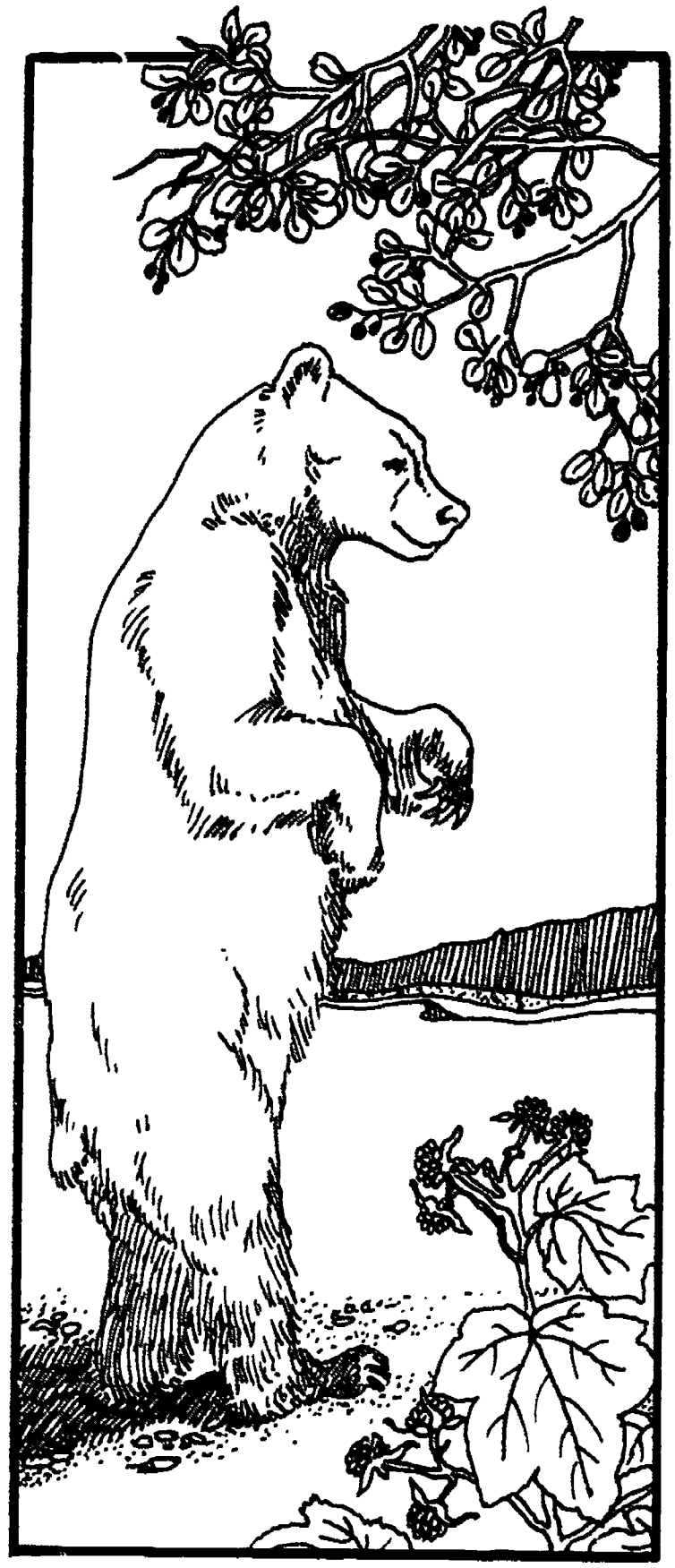
3. Have each person write his or her name on an envelope and put it on the ground (perhaps anchored with a rock) on the perimeter of the field. This represents the bear's "den" site.

4. Each child starts at his or her envelope. Assign one person to be a crippled male bear who was hurt getting away from a larger male bear. He must hunt by hopping on one leg. Assign another person to be a young female bear who investigated a porcupine too closely and was blinded by the quills. She must hunt blindfolded. Assign another child to be a mother bear with two fairly small cubs. She must gather twice as much food as the other bears.

5. Do not tell the group what the colors, initials and numbers on the pieces of paper represent. Tell them only that the pieces of paper represent various kinds of bear food. Bears are omnivores and eat a wide variety of foods, so tell the children to gather squares of different colors to get the required variety. Everyone must walk into the "forest." Bears do not run down their food; they gather it.

The children should find and pick up colored squares one at a time, placing each square in their dens before picking up another one. Pushing and shoving—any competitive activity—is acceptable as long as it is under control. Stealing food from the blind bear or the crippled bear is natural—but stealing from each other's dens is not. Remember that if bears fight (which they seldom actually do), they can get injured and unable to gather sufficient food; then they starve.

7. When all the colored squares have been gathered, have everyone pick up their den envelopes and meet in the center of the field. Compare the types and amount of food gathered by each bear and discuss the implications.[18]



ACTIVITY 23

ANIMALS AND THEIR SHELTERS

Site: Indoors and outdoors.

Objective: To identify the materials and techniques used by animals to construct shelters and learn the importance of shelter to animals.

Materials: Things found in nature that animals use to make shelters.

Note: While gathering materials and observing animals in their homes, tell the children to be careful not to harm the habitat, the animals, or their shelters.

Steps:

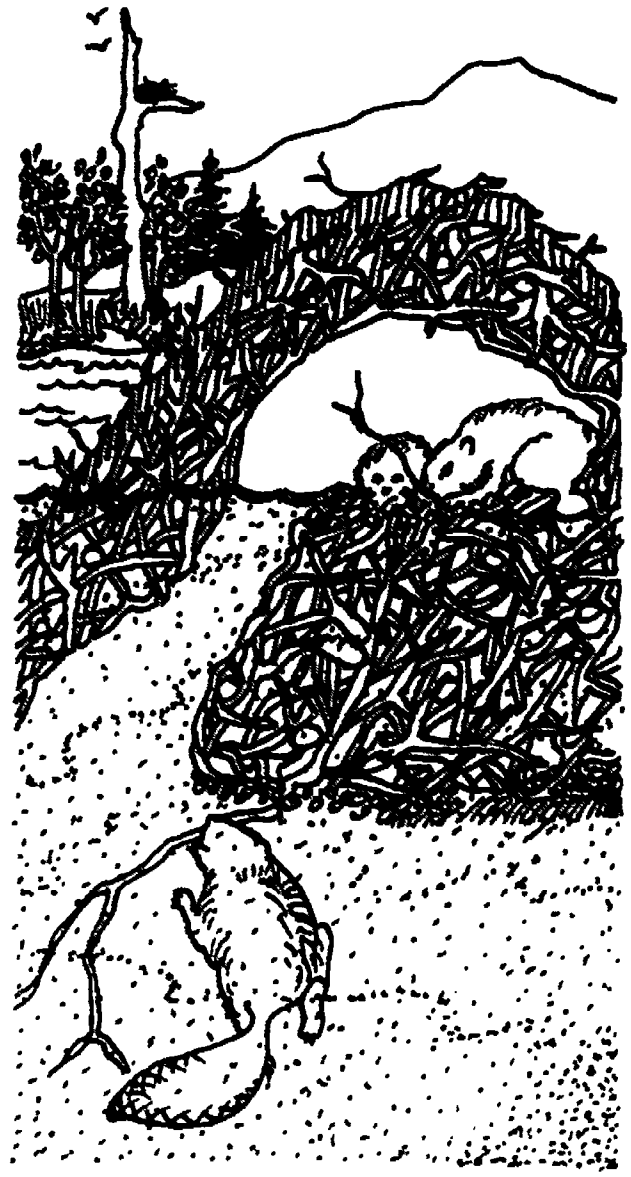
1. This can be an individual or small team project. Have each person or team choose an animal and investigate its shelter. Some animals with architecturally interesting shelters are beavers, termites, mud daubers, caddis flies, spiders, cliff and barn swallows, chimney swifts, prairie dogs, siamese fighting fish, underwater bubble spiders, and ospreys.

2. Go outside to look at actual animal homes. Use reference materials to see what animals use to construct their shelters and how the shelters are constructed. Collect materials from the environment, similar or comparable to those the animals would use.

3. Build facsimiles or models of each animal's shelter.

4. Display the completed shelters, asking the children to describe the shelter and the animal that uses it. Compare the techniques, time, and materials used by the children with those of the animals. Compare the different shelters and habitats. Discuss the consequences of habitat loss for each type of animal. Which animals are most vulnerable to loss of materials for creating shelter?

Extension: Create a diorama, putting the shelter within a model of the animal's habitat.[18]



ACTIVITY 24

MAKING A WILDLIFE RESOURCE MAP

Site: Neighborhood, park, or other local area.

Objective: To improve observation skills, and learn about the wildlife in the immediate area.

Materials: Pencil, large plain paper (such as newsprint), ruler, and a large piece of cardboard or plywood for a drawing board.

Background: A wildlife resource map is a way of describing and documenting wildlife habitats. Making the detailed observations necessary to complete the map may lead to the discovery of wildlife that the children were unaware of.

Examples of places to map are woods, parks, river or creek banks, pond, city block, or a grassy lot. Select a site with different land uses, habitats, vegetation and structures. The area does not have to be large – about an acre is enough.

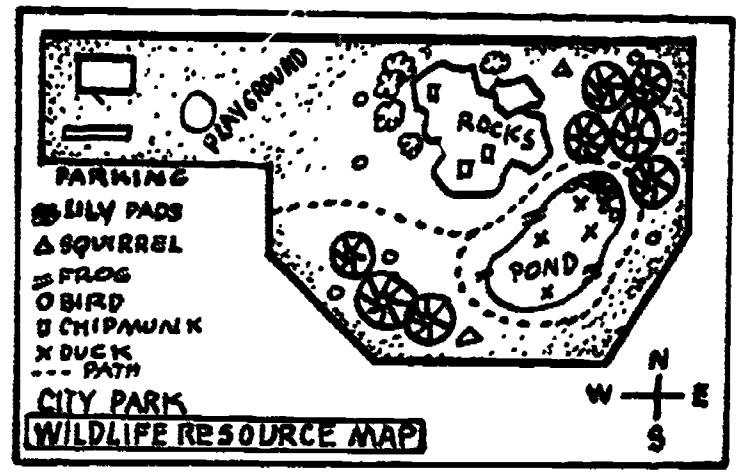
Steps:

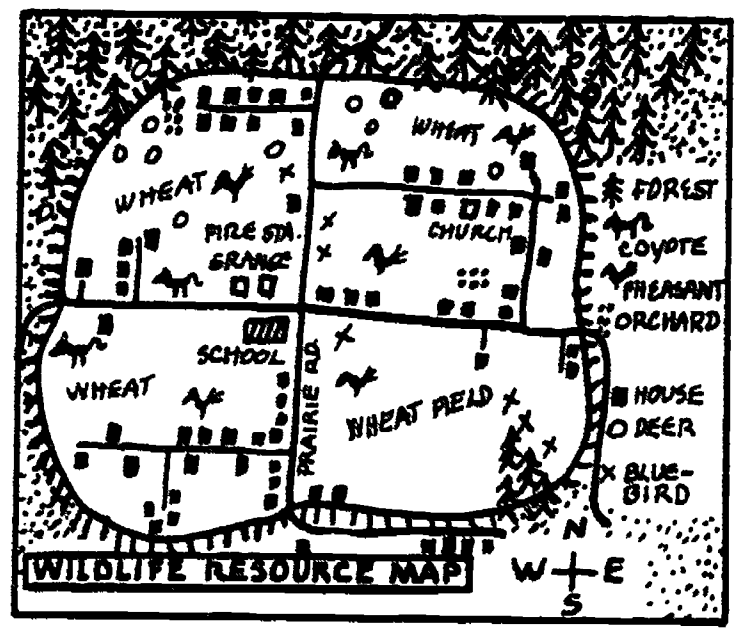
1. Make a detailed map of the selected site. Include the major man-made objects such as buildings, streets, alleys, crops, bridges, railroads, fences, etc. Then draw in the natural areas, grass, trees, shrubs, streams, ponds, and marshes using colored pencils. You will probably need about a week to make a good map. Visit the area several times at different times of the day.

2. Draw the map to scale, and give the scale in the margin. The top of the map should be north. At the bottom describe the overall environment of the site including land use, number of people, average rainfall per month, types of vegetation, air pollution, noise, and the amount and types of traffic. Show on the map where you found animals or animal traces. In the margin, list the animals and when you saw them, as well as the habitats you saw them in.

3. Compare the different habitats within the site by looking at your map. Do some areas have more wildlife than others? How does human activity such as cultivation or tall buildings affect the wildlife and their habitats?

4. List the different types of food available to the wildlife. Is there a source of water in the site? If not, how far is it in meters to the nearest water?[14]





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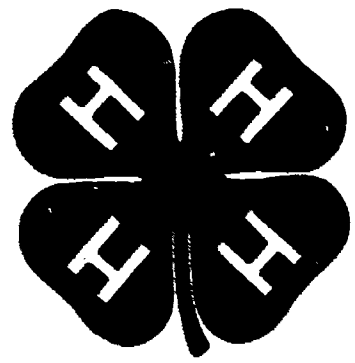

More boys and girls belong to 4-H than any other youth group.